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THE PRINCIPLES OF FRACTURE TREATMENT.

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The observation of vast numbers of fractures in the recent war and the study, in civil as well as military practice, of the possibilities of treatment have shown that the results of general fracture management can be improved and, indeed, must be revolutionized everywhere. There is no reasonable excuse for the many bad results we observe in the treatment of fractures occurring in healthy subjects. There are two problems to be solved,—the one of disseminating among medical men the gist of what is essential in the treatment of broken bones today, the other of pushing forward our knowledge of the possibilities and the requirements of fracture treatment.

The principles of fracture treatment are now fairly well thought out and agreed upon by the leaders of surgery throughout the world insofar as common practice is concerned, however much war may be waged over details and to whatever extent some principles are stressed differently in the various countries. It is the purpose of this paper to discuss the principles of the therapy of fractures from the paradigmatic viewpoint afforded by those lesions involving the long bones. I shall venture to express preferences and to suggest indications for treatment by the various possible methods.

The *principles of fracture healing* have been studied by a number of careful workers, among whom Ollier, Barth, MacEwen and Axhausen have been extremely prominent. Although Ollier maintained with exceptional brilliancy that transplanted periosteum gives rise to the growth of bone at its new site, it seems now to be settled that at least a shell of bone, bearing osteoblasts, must be carried with the periosteum to bring about this result. For the clinician it is amply proved that, where it is desired to secure, by surgical methods, a regeneration of bone, it is necessary to have cortical bone-tissue together with its periosteum placed in contact with functionating normal bone, in the normal vascular environment and so related to the rest of the body that functional demand shall be made upon it. Albee has been insisting that the medulla may properly and wisely be carried along with the other elements when one employs grafts. But Delagénière boldly uses periosteum with a thin layer of bone attached to it to make good defects in general. To the application of this principle we shall return later.

Reduction. If the fragments of a broken bone are restored to and maintained in their exactly normal relation to one another the amount of new bone necessarily to be produced in order to reunite the parts is minimal, indeed. The difference in the demand made upon nature under these conditions and that made in the effort to unite a widely separated group of fragments is colossal—a fact not too often considered by observers. Reduction, the replacement of fragments, is a necessity if the displacement is great or if the new relations would compromise function or leave undue unsightliness.

Both anatomical restoration and functional restitution are obviously necessary in the treatment of these injuries. Hence, on the one hand, we have champions who insist more upon accuracy of reduction as a prime necessity and, on the other hand, those who demand imperatively the centering of attention upon the restoration of function,—the matter of unduly large callus or the slight misplacement of fragments being considered of no relative importance. Sir Arbuthnot Lane of England, Lambotte of Belgium and Rovsing of Denmark have ranged themselves in the first group; Lucas Championnière was the protagonist of the second. Steinmann wisely protests that we must preserve balance in these matters and that no treatment is satisfactory that does not provide simultaneously for both the phase of anatomical theory and that of actual practice. Krabbel (Bruns' Beitr z. Klin. Chir., **125**, 1 and 3) has just published a study of what he calls functional fracture treatment in which he complains that Lucas Championnière's recommendations have not been widely followed even in France, while in England surgeons, under Lane's leadership, have tended toward open operation if the fragments of bone were not replaceable with accuracy.

In comment I must say that we should not estimate the influence of Lucas-Championnière so rigidly. We should rather recognize that his teachings, which, rationally understood and interpreted are cogent, indeed, have profoundly influenced the sur-

gical world attitude toward fracture-treatment. We have been emancipated forever from the fixed doctrines of immobilization treatment.

In no domain of surgery does the demon of malpractice threaten so grimly as in fracture-treatment, making fixed authority on which to lean a matter of serious import. With the general acceptance of the principles fought for by Lucas-Championnière, the management of fractures is now a matter of individual choice and determination. Krabbel has emphasized a similar emancipating influence exercised by recent war surgery, the insistent demands of which have freed surgeons of many conventions.

I cannot, however, approve Krabbel's apparent commendation of the so-called functional treatment for laboring people as standing in valid opposition, by right, to a more rigid treatment for people of the other classes of society. Such an admission (namely, that the laborer may get along with a rapid healing at the cost of a somewhat deformed limb) is subversive of our finer professional feeling and ethics. I cannot consider that we can justly oppose the so-called anatomical method to the functional method in such a manner.

Let us consider the matter on a broader basis. When the parts of a fractured bone are displaced from exact anatomical relationship and reduction is impossible by manipulation, the conditions present may be tolerated and the fracture may be allowed to heal provided the surgeon considers that the relation of the fragments to one another is such that when union has taken place with the formation of a reasonable amount of callus *there will not be such deformity or disturbance of function as to interfere unduly with the patient's life activities.* If, however, the decision is the reverse, and if a surgeon is available who can command a highly probably aseptic as well as mechanically correct technic, then an open operation may be undertaken.

This presentation does not limit one to a single class but considers all classes, even all individuals, and leaves the surgeon free to place the conditions and prospects before the patient himself for adjudication.

Moreover, wide latitude is given the surgeon in the choice of methods. He is not to be compelled to provide, for example, a given length of femur. Surgeons must be free to study their case individually. One patient may prefer a quick healing with some deformity and no operative risk; another may make an opposite choice.

Accuracy of fragment-adjustment often cannot be attained without exposing for a few minutes the ends of the broken bone, usually under mechanical distraction, so that interposed tissues may be removed, displaced fragments readjusted in relation to one another and the maintenance of this state assured occasionally by applying some mechanical retaining device. But this means an open operation and the conversion of a simple fracture into a compound one, at least temporarily.

Now, the dangers of open operation in simple fractures are appalling and the results attained by men who are not specialists, operating on people of weakened vitality and under hospital conditions that are, to say the least of them, not ideal, are shocking. In Kellogg Speed's article on Treatment of Fractures of the Femur in *Archives of Surgery* (**2**, 1, 1921) he states that in one large charitable institution in which many surgeons operate, 51 fractures of the femur out of a total of 526 were treated by open operation, with 4 deaths and *more than 50% of bad results among the survivors!*

Reduction ought to be effected if at all possible, by methods short of fully developed operative intervention, with the purpose of relieving the patient of the risk of infection and destructive inflammatory action. Anesthesia frequently contributes greatly to the conditions needed for reduction; and many surgeons recommend that repeated efforts render all favoring conditions be made on different occasions to effect the bloodless replacement of parts before open operation is undertaken.

The method of treating fractures by percutaneous devises, so prominently presented in surgery long ago by Malgaigne in his pateller books, is now recognized as of value and relatively free of risk. In a recent editorial in *Surgery, Gynecology and Obstetrics,* Leonard Freeman concludes that "one should at least, in the light of existing evidence, recognize their practicability and safety." Among these the percutaneous use of small levers may be of great value. In difficult cases of Colles' and other fractures near the ends of bones where one of the fragments is very short, a puncture may be made and the end of a small chisel introduced to produce leverage. In this way the lesser fragment may be pried into place with but little risk or difficulty.

The *principle of extension* may be necessarily brought into requisition for the purpose of aiding in reduction as well as to maintain the proper relations of the fragments. In fractures of the femur, for example, where overriding has occurred, the fragments will sometimes have been so displaced that one will have been rotated about the other, mak-

ing proper reduction impossible without extension. In a fracture of the femur at the junction of the middle with the lower third, occurring in a ten-year old boy, a patient of mine, who had had practically no treatment for eight weeks, overridding to the extent of more than two inches had taken place. Under anesthesia the bone was exposed by a long, clean incision and the fragments were found to be displaced in the way described. Pulley and cord extension by apparatus was made until distraction had occurred. Then with Faraboeuf forceps the fragments were seized and carried, the one about the other, until they were opposite one another in normal relationship when the distracting force was diminished and the irregular ends were allowed to come together. The interlocking of the jagged ends was perfect. But, to be sure that displacement did not occur, a Putti-Parham-Martin band was applied. A perfect result followed.

Such an application of extension would be an operative intervention involving table- or at least pulley-and-cord extension, whereas, when we speak of reduction by extension in general we usually have in mind gradually applied force acting through apparatus attached to the limb for a considerable period.

It was American surgeons who first popularized adhesive-plaster extension; and the introduction of the method into Germany by Volkmann from America and its later systematic application by Bardenheuer of Cologne constituted a marked advance in the surgery of fractures for that country. But, while this mode of applying extension is satisfactory in ordinary cases, it is not this sort of extension that is effective for reduction in the more difficult forms of fracture displacement. Its effects are too slowly obtained and its results too uncertain. It is better adapted to the treatment of fractures of a moderate degree of difficulty.

It is here that should be emphasized the revolutionizing effect of *direct skeletal extension,* the credit for which belongs to Codivilla and to Steinmann. While the former had originally proposed extension of that type for certain orthopedic uses, it was Steinmann who applied it to the management of fractures.

The use of one or another modification in technic or the devising of a new form of "tongs" should not be seized upon as an excuse for the alienation of honor from those who gave us the great principles of skeletal extension. Science knows nothing of patriotism or national boundary lines. The errors of the savants of one nation in refusing credit to the scientists of another nation for making advances in our common knowledge give no legitimate excuse for repeating the offense. Since the great war the Codivilla-Steinmann principle has been frequently used by the surgeons of some nations without giving the smallest credit to the originators.

In many respects the original method of Steinmann has not improved upon by later modifications. One drives a polished, sharpened steel bar the size of a small lead-pencil transversely through the bone and makes extension from its ends. In cases not to be transported after the introduction of the bar, where the common precautions of aseptic surgery are taken, there is no reasonable likelihood of infection (Pierson, *Fractured Femurs*). Nevertheless the later modifications of the method by the use of tongs that are provided with devices for lifting the depth to which the bone is penetrated should be utilized in ordinary cases.

Here I wish to insist that the Codivilla-Steinmann principle of extension has not as yet been recognized and utilized in America as it should be. Its value is infinitely greater than it is commonly conceived to be, its dangers almost nil if care is used. It makes possible the application of quite adequate degrees of traction—50 to 150 pounds of force where necessary—without pain, injury to the soft parts or interference with the neighboring joints. In fact the freedom from discomfort enjoyed by the patient and the possibility of making passive and even active movements of the joints while the extension is in place constitute a revolutionary advance in the management of certain classes of fractures, especially those of the leg and thigh.

The test of the value of skeletal extension methods is their application to the reduction and treatment of fractures in the shaft of the femur. And the brilliantly successful use of this principle of extension by Pierson in the treatment of hundreds of war fractures of the femur has caused all surgeons familiar with the thought to rejoice over our enfranchisement from the old thralldom of supposedly necessary malposition, rigidity and articular stiffening, or the alternative of open operation. The bugaboos of infection and pain from the use of the method have been effectually laid forever by the extensive experience of many surgeons. Gross carelessness in the us of skeletal extension may, however, lead to the loss of a leg or even of life itself from sepsis.

The application of this mode of reduction means the continued use of it in treatment if the fragments are found, by the use of the *x*-rays, to have been brought into proper relationship after a few days' heavy extension. Fortunately, wide experience de-

monstrates that the various deformities additional to simple overriding can be corrected, in most cases, by changing the direction of pull or by applying additional force laterally or antero-posteriorly to the fractured shaft. Pierson is fond of using the Thomas hip-splint as a casing or general support for these legs; and, in this dressing, the occasionally necessary lateral pressure and traction can be made with ease.

Since distraction can thus be effected even to the extent of lengthening the limb there is usually no need of permitting femur fractures to proceed to healing with a shortening of more than half an inch. But the true secret of success must still lie in the most painstaking and persistent study and management of every case, with the making of new *x*-ray plates every five days or so and the modification of force-application and mechanical support to suit the varying requirements of the case.

Not the least advantage of skeletal extension lies in the facility with which it admits of joint movements during healing. The danger of ankylosis, so much dreaded by the surgeon in these fractures, is almost nullified by the use of this principle.

Paralleling and practically equalling this Italian-Swiss method of reduction and treatment is the ingenious method of the Belgian surgeon, Lambotte. He uses an apparatus consisting of a perforated steel bar placed alongside the leg, with long steel pins passing through the holes. These pins are introduced through the skin and other soft parts into the bone-fragments. As they are longitudinally movable they may be used to make extension or distraction upon the bone-fragments or to modify the relations of the fragments in other ways. By manipulation with this apparatus the bone-fragments can be put in exact reduction under the *x*-rays. But the Lambotte method, attractive though it be, is not often needed if the Codivilla-Steinmann extension is available.

Lambret, a French surgeon, conceived the idea of passing a steel pin through each end of a fractured long bone and making extension by uniting their ends by means of bars that can be lengthened or shortened by turnbuckles. Lambret, and not those who have modified his apparatus, should have the credit of giving us this principle of the double Steinmann nail apparatus for a single limb. Its usefulness is to be recognized when we consider the difficulty involved in the management of multiple fracture of both bones of the leg, especially where there is simultaneous injury to the femur or the foot. We will appreciate the comfort of applying a Steinmann nail through the head of the tibia and another through the malleoli and manipulating the bony masses fixed in this way by means of a steel rod on each side of the leg, fitted with turnbuckles.

Less effective, but still extremely useful for the same purpose, is Hackenbruch's apparatus, which consists of a two-part plaster of Paris cast, of which one piece is placed closely about the upper part of the limb involved, the other about the lower end of the leg-cone, grasping the malleoli, this cast holding in its structure two steel rods, one on each side, provided with turnbuckles to lengthen or shorten the limb. Such an apparatus, carefully applied, will render unnecessary most operations for fracture of both bones of the leg, to say nothing of its great value in fractures of other long bones.

Operative exposure of the bone must occasionally be made, although the vast majority of simple fractures heal as such. It is useless at this time to attempt an answer to the question, so naturally arising in our thoughts, in what percentage of fractures of the long bones open operation is necessary for reduction. This is especially true because surgeons are so commonly unaware of the possibilities of skeletal extension, which enables us so often to effect reduction without incision. Its application smoothes away great categories of difficulties that cluster about the management of muscular spasm, contracture due to delayed treatment and that displacement of fragments which is caused by the proximity of joints to the fracture, together with the preponderant action of special muscle groups that possess local mechanical advantages over their antagonists. After a few years of further study this statistical question will be answerable.

Meanwhile there are a few cases that clearly demand open operation for reduction; cases where, in other words, satisfactory adjustment of the fragments cannot be attained without direct access to the displaced parts. This will be found to be the case especially where there are displaced fragments near joints, which do not yield to the better conditions supplied by the extension apparatus.

The art of the surgeon must be exercised in this matter of open reduction with the utmost skill at his command in order to avoid the catastrophe of contracture after healing has taken place. If large muscles become bound together the limb is permanently impaired in action. So incisions should be sufficiently large to render unnecessary the fraying of muscles and fasciae during manipulation. The careful study of *x*-ray plates before operation enables

the surgeon to plan in such a manner that his work may be completed methodically and promptly.

The *apparatus* required *for extension* during reduction must be provided with care. Without adequate extension apparatus the reduction may be impossible and the surgeon may find himself obliged to shorten the bone fragments to obtain alignment. This melancholy misfortune condemns the patient to permanent impairment of function in most cases. It is a delight to the surgeon to observe with what ease a limb, shortened by contracture after days or weeks of neglect after fracture, can be brought to the normal length or even to a greater than normal length by the use of proper apparatus. I prefer the McKenna table for this work, but the tables of Hawley, Albee and other surgeons are adequate. Even the Eccles portable apparatus can be made to answer requirements indifferently well if it is applied to a specially prepared small wooden table.

Besides the extension apparatus and the instruments needed for the work on the soft parts one must be prepared to manipulate the bones themselves. The instruments with which the fragments are grasped are of prime importance. My favorite appliance for this work is the Lambotte forceps or the well-tried Faraboeuf forceps, but they must be well made. Some instrument makers supply poor models. Two such forceps are desirable. The double-lever bone-holding forceps seem strong and handy. Lambotte's models of forceps are admirable.

Other special bone-holding forceps are often used. The popular Lowman clamps require much stripping up of soft tissues; and complex bone "jacks" seem unnecessary. On the other hand, two bone levers of steel are needed to move fragments about. The operator suits his taste in the choice of cutting forceps and small pliers. The modern heavy, short-handled hammer is a relief after the old pattern. And the many-sized, thin, knife-edged chisels of Payr are a joy to the surgeon-artist in lifting small pieces of bone with their attached portions of periosteum, to be transplanted to new sites.

The instruments to be added for *osteosynthesis* must be at hand. Important are: sutures, of catgut, silk, kangaroo-tendon, silver, iron, "Vienna silk", aluminum-bronze; nails or pegs and bolts of ivory, bone, iron, steel and silver; bands of various materials, especially of silver and of soft iron (with the Codivilla wire-banding instrument or its imitation in the Putti-Parham-Martin banding apparatus). And finally, metal plates, which the surgeon can readily make, in leisure moments, out of soft silver for the simpler cases, or the excellent oval Lambotte plates, or the well-known plates of Sir Arbuthnot Lane fashioned of vanadium steel.

With this armamentarium ready, the surgeon exposes the fractured bone ends by such an incision as will cause the least mutilation, be most favorable for wound healing and leave a small, well-placed scar. As the next step in his work, he frees the bone ends of interposed parts and overgrown scars. There is no objection to the snipping of an interposed band of fascia or the excision of a small mass of muscle. But care must be taken not to destroy or to impair structures that may be used in the healing process. In operating some time after fracture the medullary canal must be freely opened to permit the medulla to take part in the healing process.

A striking illustration of this necessity occurred in the case of a young, healthy man who had sustained a fracture of both bones of the leg at the junction of the upper and middle thirds. As delayed union occurred a Lane plate was applied by his attendant, but without result. The plate was later removed and scars excised. After nine months of this treatment the patient was brought into my care. It was found on operation, as expected, that the medullary canal was blocked by connective tissue. As I was working with Albee's electric bone instruments I bored a hole with the quarter-inch trephine into each bone-fragment, exposing the medulla extensively. Then parallel saw-cuts were made with the double (twin) saw down the front of the tibia for a distance of seven inches,—four and a half inches below and two and a half inches above the fracture line. The long piece of healthy bone was placed across the fracture line forming a bridge and the small fragments from above were used to fill the gutter below. No internal fixation was necessary, a cast holding the parts in apposition easily. After two weeks massage was begun, the cast being temporarily removed for the purpose. Union occurred slowly, but surely, with full restoration of function.

If there is overriding the extension overcomes it and the operator, with abundant assistance, by lateral pulling and prying with levers endeavors to get the bone ends together. The happiest result of these efforts makes it possible for the operator to order the relaxation of the extension apparatus, permitting the distracted, ragged bone-ends to slip into exact interlocking relationship. Sometimes the point of fracture can scarcely be seen at a casual glance when this mode of reduction has been effectual.

(*To be continued*)

INDICATIONS FOR AND AGAINST OPERATION IN THE TREATMENT OF INJURIES TO THE HEAD.*

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The apparent triviality of the initial symptoms and signs of many acute brain injuries with or without a fracture of the skull is, indeed, confusing and at times permits a most serious delay in the treatment. Cases of acute intracranial lesion occur not so infrequently in our industrial life of peace times, but that we should always be most careful in our examinations of patients having a history of a recent head injury of even the most trivial character, and especially is this true of children, who withstand the acute effects of brain injuries much better than adults; the loss of consciousness may even be absent in them until the terminal period. There are several tests that should always be employed and repeatedly performed, if necessary, upon these patients not only to locate the site of the brain injury but, far more important, to ascertain the presence or not of increased intracranial pressure, whether that pressure is due to intracranial hemorrhage or to cerebral edema (an excess amount of cerebrospinal fluid). As is well known, if we exclude depressed fractures of the vault which should always be elevated or removed for fear of future complications, the fracture in these cases is possibly the most unimportant part to be considered in the treatment, whereas the presence of a marked increase of the cranial pressure with or without a fracture of the skull should immediately cause the patient to be withdrawn from that large group of patients properly treated by the expectant palliative method, and the advisability of an early operative procedure to relieve the increased intracranial pressure should be considered.

In the treatment of brain injuries with or without a fracture of the skull, if the patient is allowed to develop a definite paralysis, a lowered pulse rate, Cheyne-Stokes respiration and pulse, and that appalling group of extreme intracranial signs, then I agree entirely with the opinion that was so commonly held, that these patients "get along" just as well without operation as with operation at this late stage, the mortality being 50 per cent. and even higher. But patients with brain injuries should not be allowed to reach this dangerous stage of medullary compression due to the high intra-cranial pressure. It should be anticipated by the accurate diagnostic methods now known, and if a marked increase of the intracranial pressure is ascertained, then an early relief of it should be advised, not only to save the life of the patient, but also to lessen the post-traumatic conditions of changed personality (either of the excitable or of the depressed type), persistent headaches, early fatigue, occasionally epilepsy and that long train of conditions so frequent in brain injuries which, in my opinion, in the majority of cases are due to a prolonged increase of this intracranial pressure. Besides the lowered pulse- and respiration-rates, which are comparatively crude signs of an increased intracranial pressure (and if of the irregular Cheyne-Stokes type, then late signs of extreme intracranial pressure with its resulting medullary compression) the two most valuable procedures for determining a definite increase of the intracranial pressure are the examinations of the fundi of the eyes with the ophthalmoscope and the measurement of the pressure of the cerebrospinal fluid at lumbar puncture by means of the spinal mercurial manometer.

Although it is rare for a measurable papilledema and "choked disks" to occur in these cases of traumatic intracranial lesions with or without a fracture of the skull, yet the earlier and, therefore, milder degree of an edema of the optic disks should be most carefully watched for with the ophthalmoscope as being one of the accurate signs of the presence of a definite increase of the intracranial pressure. Ophthalmoscopy, especially the direct method, is most valuable in the diagnosis of intracranial lesions.[1] Rarely do these fundal examinations reveal an increased intracranial pressure within six hours after the head injury; this is because of the presence of shock. As head injuries are usually accompanied by shock of varying degrees, naturally in these cases the blood pressure is low so that even if a large intracranial vessel is torn, yet there can be only a comparatively small amount of hemorrhage because the resulting increased intracranial pressure will soon be greater than this lowered blood pressure of shock and, therefore, the bleeding will cease. As the patient recovers from the condition of extreme shock, the blood pressure rises and more bleeding occurs until the intracranial pressure again equals the blood pressure. Finally, if the patient survives this condition of shock, then the blood pressure will be continuously greater than the intracranial pressure, so that this increased intracranial pressure will produce its characteristic signs in the fundus of the eye—a dilatation of the retinal veins, and an edematous blurring of the nasal halves and, if still higher, then an edematous obscuration of the temporal halves of the optic disks. A measurable

*Read at the Thirty-First Annual Meeting of the New York and New England Association of Railway Surgeons, 1921.

papilledema and "choked disks" occur only when the intracranial pressure is extreme from a large intracranial hemorrhage of slow formation, such as the extradural middle meningeal type—just as in cases of brain tumor or when the ventricles are blocked, producing an internal hydrocephalus.[2] Naturally, if the intracranial hemorrhage is very rapid and of large amount, the patient usually dies within several hours so that there is very little time to produce "choked disks;" again, the shock following head injuries usually lasts for about six hours in the patients who survive and, therefore, it is rare within these first six hours for the ophthalmoscope to reveal definite signs of an increased intracranial pressure; it may be also noted that the patients who do not survive the condition of shock, usually die within the first six hours. It is, therefore, of the greatest importance to recognize these early signs of increased intracranial pressure by repeated ophthalmoscopic examinations and to realize that these edematous blurrings of the optic disks are more than merely within physiological limits. It is true that in cases of myopia there is normally an obscuration of the disk outlines, but these patients can be excluded by the second and following test, which should always be performed.

The most accurate means now known for ascertaining the presence or absence of an increased intracranial pressure is the measurement of the cerebrospinal fluid at lumbar puncture by means of the spinal mercurial manometer. It is similar to a blood pressure apparatus, the procedure is as safe as a lumbar puncture when properly performed, and by it the varying degrees of intracranial pressure can be carefully recorded. The normal pressure is 5-9 mm. of mercury, so that if a pressure higher than 15 mm. is obtained at lumbar puncture, then the signs of intracranial pressure as shown in the fundus of the eye are confirmed. This method of estimating intracranial pressure is most important in the differentiation of the condition of cerebral spastic paralysis due to intracranial hemorrhage at birth from those other causes of Little's disease.[3] In other intracranial conditions producing the extreme stages of papilledema and "choked disks," and even their end-results of secondary optic atrophy as in neglected cases of brain tumor, naturally it is not necessary to confirm the ophthalmoscopic findings in order to make a diagnosis of increased intracranial pressure. If, however, in these traumatic lesions of the brain we must wait until a "choked disk" results from extreme intracranial pressure in order to state that the intracranial pressure is increased, and if we must wait for the pulse rate to descend to 60 and below and the respiration and pulse to assume the irregular Cheyne-Stokes character of medullary compression, then undoubtedly the mortality of these patients will be 50 per cent. and higher. Patients should not be allowed to reach this dangerous stage of medullary compression. This stage should be anticipated—and it can be by repeated ophthalmoscopic examinations and the measurement of the pressure of the cerebrospinal fluid at lumbar puncture.

In selected cases of mild intracranial pressure due to trauma, very frequently the convalescence can be shortened, the headaches relieved and the general condition of the patient greatly improved by lumbar puncture and, if necessary, by repeated lumbar punctures; not only will the edematous "wet" condition of the brain be drained in this way, but a prolongation of the increased pressure will be avoided and, therefore, the definite danger of the post-traumatic conditions so common in these cases will be lessened. Naturally, this method is only applicable in mild, selected cases, and lumbar puncture should never be advocated as a means of drainage in patients having high intracranial pressure or in subtentorial lesions, for fear of a consequent medullary compression in the foramen magnum.

We now come to the most important and difficult question in the treatment of brain injuries with or without a fracture of the skull. "If an operation is advisable, when should it be performed? " This question can more easily be answered by stating the two periods when the operation should not be performed. Naturally, we must exclude the majority (about two-thirds) of cases of fracture of the skull who do not have a definite increase of the intracranial pressure and, therefore, no operation is indicated. (The depressed fractures of the vault should always be elevated or removed.)

The two periods in which an operation is distinctly contraindicated in cases of brain injury are, first, the condition of severe shock in the very beginning and, second, the condition of medullary collapse—the death knell of the patient. No matter how badly the skull is fractured, or how extensive the intracranial hemorrhage seems, while the patient is in the condition of severe shock, with a pulse rate of 120 and higher, operation at this period takes away whatever chance the patient may have of surviving the shock; the operation is but an added shock and merely hastens the exitus. No patient having a brain injury should be operated upon in this condition of shock; the mortality is very high and if a patient does recover from an operation in this period, he recovers in spite of the operation. Cranial operations for brain injuries in this stage of shock were frequently performed in the past and most disastrously,

and thus operations were almost discredited in the treatment of brain injuries. The natural reactions in the medical profession following these early operations in the period of severe shock was to wait until there could be no possible doubt that the patient was going to die, unless, as was thought, a cranial operation was performed; that is, the patient was permitted to reach the period of extreme medullary compression—a pulse rate of 50 and below, irregular Cheyne-Stokes respiration and pulse and profound unconsciousness—before a cranial operation might be considered. This is a most dangerous stage for these patients to reach, and it is doubtful whether recovery will occur even with an operation at this period. But if the patient has struggled through this period of medullary compression, and finally reaches the stage of medullary edema, when the pulse rate begins to ascend quickly to 70, 80, 100, 120 and higher, the respirations become rapid and shallow, that is, the stage of medullary collapse, then he is in the second period, in which they all die, operation or no operation. I feel that if these two extremes can be avoided (and the latter of these, medullary collapse, can certainly be anticipated in the operative treatment of brain injuries and their signs cannot be overlooked) the rational treatment from an operative standpoint depends upon the presence or not of a definite increase of intracranial pressure whether there is a fracture of the skull or not. In some of the most serious cases no fracture was present, as determined at operation, or at autopsy. The aid of the roentgen-ray is important in the treatment of these traumatic cases only in patients with doubtful depressed fractures of the vault, and in latent fractures of the skull, where the bump is apparently so trivial that the patient might not be so carefully examined and treated as the condition would warrant. On the contrary, no patient with high intracranial pressure should be allowed to wait "over night" or for a period of hours merely to secure a roengenray picture of the skull. It is of no importance in the treatment of these acute intracranial lesions whether a fracture is present or not. If there is high intracranial pressure as shown by the ophthalmoscopic examination and by the measurement of the pressure of the cerebrospinal fluid by the spinal mercurial manometer, then a cranial operation is indicated to relieve this pressure both by enlarging the intracranial cavity and by the drainage of possible hemorrhage and cerebrospinal fluid. It is not so much a question of removing the blood as it is of lessening the increased intracranial pressure; whether that pressure is due to hemorrhage or edema, the operative indication is the same. Many cases of head injuries at autopsy have revealed no hemorrhage at all, merely a "wet," edematous, swollen brain, sufficient to cause medullary compression and the death of the patient.

If an operation is considered advisable to relieve the increased intracranial pressure, then the operation of choice is subtemporal decompression and drainage;[4] if there are no definite localizing signs of the intracranial lesion, then the decompression should always be performed on the right side in right-handed patients in order to lessen thereby any possible operative damage to the adjacent motor speech area. In these cases, it is not so important to remove the blood as it is to offset its pressure effects. In cases of depressed fractures of the vault showing definite signs of high intracranial pressure it is better surgical judgment to precede the elevation or removal of the depressed area of bone by a subtemporal decompression so that when the depressed bone is removed that there will be little or no danger of the underlying cerebral cortex being damaged by its protrusion through the bony openings. The subtemporal decompression exposes a comparatively silent area of the brain—a portion of the temporosphenoidal lobe—its protrusion and possible damage would not appear clinically, whereas a partial paralysis, impairment of sensation or of vision might occur, and frequently does result, from operations performed over the more highly developed areas of the cerebral cortex. Besides, the subtemporal route not only provides an excellent exposure of the middle meningeal artery and that portion of the brain so frequently involved in fractures of the skull, but it also affords drainage of the middle fossa of the skull —the chief intracranial cistern—at its lowest point at the base of the skull; again, the thinness of the squamous portion of the temporal bone makes the operation a less difficult one technically. The vertical incision (and not the curved incision) should be used, to render the operative hemostasis more effective in that the trunk of the temporal artery is clamped at the lowest point at the very beginning of the operation and, therefore, there is no bleeding from its branches. This incision also permits the removal of the underlying squamous bone as far as is possible beneath the temporal muscle—a diameter of three inches—and yet the attachment of the temporal muscle to the parietal crest is left intact so that a firm closure of its separated muscle fibers is assured. This is a most important point in cases of high intracranial pressure as in brain tumor where a cere-

bral hernia or fungus might result from an imperfect closure of the temporal muscle.

If the intracranial pressure is so high that the cerebral cortex tends to protrude through the bony opening, it is frequently wiser in selected cases to perform a similar operation upon the opposite side of the head immediately after the first operation. I have been obliged to do this in only five per cent. of the patients; they are the ones having a swollen, edematous brain—"waterlogged," as it were—where the drainage of blood and cerebrospinal fluid is slight and not sufficient to cause a marked decrease of the intracranial pressure. In many doubtful cases, it is better judgment to wait one or two days and even longer before the second operation is considered advisable. The rubber tissue drains are usually removed on the first or second day post-operative, and the hospital convalescence ordinarily requires at least two weeks. Naturally, these patients should not enter into their former active life for a period of three months or even longer; a too early return to the strain and stress of modern life predisposes them to many complaints, both subjective and objective; repeated examinations of the fundus of the eye and of the superficial and deep reflexes are here most important in estimating the physical normality of the patient.

During the eight years, 1913 to 1920, I examined and treated personally over five hundred adults having acute brain injuries with or without a fracture of the skull; in only 31 per cent. of these patients were there marked signs of an increased intracranial pressure and, therefore, only these patients were operated upon to relieve this increased pressure, whereas the remaining 69 per cent. of the patients did not show definite signs of increased intracranial pressure and were, therefore, treated by the expectant, palliative methods of absolute quiet, ice helmet and catharsis, and, when needed, the routine treatment of shock. It is thus seen that only one-third of the patients having acute brain injuries with or without a fracture of the skull were operated upon and approximately this same ratio has continued during the past year. The careful determination of the advisability of operation, the type of operation, and—of the greatest importance, the ideal time for operation has made it possible to lower the mortality of the so-called "fractures of the skull" from the average of 50 per cent. of most hospitals to 30 per cent. in this series of cases. If we exclude the moribund patients dying within three hours after admission to the hospital from shock and internal injuries (in many cases the fracture of the skull being but an incident in the condition), the mortality is lowered to only 19 per cent. The alcoholic, arteriosclerotic and nephritic patient so frequently admitted to the large municipal hospitals following a cranial injury is a greater risk than is the usual type of patient in private practice or at the smaller private hospitals, so that this mortality practically must be remembered when statistics of brain injuries are discussed. In the former group, even the most trivial cranial injury may precipitate an extensive cerebral edema; the reaction and resistance to this condition is greatly impaired, and thus the mortality rate is higher in these municipal hospitals admitting a large number of this type of patient.

The end-results of brain injuries with or without a fracture of the skull have been a most interesting study. It has become quite a common belief that once a man has had a fracture of the skull and recovers, he is never the same person again. In 1912, the records of three of the large hospitals of New York City during the decade 1900-1910 showed a mortality for fractures of the skull of 46-48 per cent. The mortality of the patients operated upon was 87 per cent., this high percentage due undoubtedly to the operation being postponed until the extreme stages of medullary compression and edema, and also to the fact that the operation performed was the "turning down" of a bone flap—a much more formidable procedure than a decompression—and without even the benefits of a decompression. Moreover, in many cases the dura was not opened, and as the dura is inelastic in adults, no adequate relief of the pressure could possibly be obtained. However, of the patients who were finally discharged as "well" or "cured," I was able to trace only 34 per cent. Of those 34 per cent. of the total patients, 67 per cent. were still suffering from the effects of the injury, that is, two-thirds of them were not as well as before the injury. The chief complaints were persistent headache, a change of personality of the depressed or of the excitable type and thus emotional instability, early fatigue, making any prolonged mental or physical effort very difficult, lapses of memory, spells of dizziness, and even epileptiform seizures in a small percentage. In examining the hospital records of the patients having these post-traumatic conditions, it was most interesting to ascertain that these were the patients—and there were but few exceptions—who regained consciousness gradually after several days and remained in the hospital for a period of four weeks and longer, whose charts made frequent mention of the severe headache and a pulse rate of 60 and in some cases below

60, i. e., the usual clinical signs of an increased intracranial pressure; ophthalmoscopic examination had rarely been made. Many of these patients still showed in 1912 the results of the increased intracranial pressure in their fundi and at lumbar puncture. These were the ones upon whom a cranial decompression even at this late date caused a marked improvement; the operative findings were always associated with a "wet," swollen, edematous brain with connective tissue in the sulci about the supracortical veins. Many of the so-called post-traumatic neuroses are, in my opinion, frequently superimposed upon this definite organic basis.

The treatment, therefore, of brain injuries should not be limited merely to the recovery of the patient as far as life is concerned, but it should also be directed toward obtaining a normal individual, approximating as closely as possible the condition of the patient before the injury.

20 WEST 50TH STREET.

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THE INDICATIONS FOR THE RADICAL MASTOID OPERATION.

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No hard and fast rules have been formulated as a guide to determine whether or not the radical mastoid operation should be performed on cases of chronic suppurative middle ear disease. However, certain fundamental principals must be observed in determining the necessity for such surgical intervention. The mere presence of long continued aural discharge without other symptoms should not be the deciding factor for this radical procedure, even though evidence of exposed bone is present in the middle ear. If the discharge is foul, and the hearing considerably diminished with no other symptoms being present, it is no surgical indication for the Schwartze-Stacke operation. Foul discharge, exposed bone in the middle ear, and markedly diminished hearing—even this triad is not sufficient ground for this procedure. However, when the discharge is foul, exposed bone is present in the middle ear, the hearing is markedly reduced, and there is headache which is not present on arising in the morning but appears a few hours after and gradually becomes more intense toward the end of the day, there is suggestion that the disease is not confined to the middle ear spaces, but is producing a certain amount of meningeal irritation which, in turn, is suggestive of a deep-seated bone necrosis. With this combination, the advisability of exenterating the mastoid and the middle ear must be seriously considered.

The character and the source of the headache must be thoroughly investigated before it can be considered as a symptom referable to the disease existing in the ear. Headache may be due to other conditions, even though chronic aural discharge is present. It may be occasioned by refractive errors and muscle imbalance of the eyes, to disease of the nasal accessory sinuses, diseased teeth or faulty eruption of teeth, or diseased tonsils. The pain in the head may also be due to pathological conditions in other parts of the body, such as nephritis, arteriosclerosis, gastric and intestinal disturbances and perverted physiology of ductless glands and genital organs. Headache due to paranasal sinus disease and diseased tonsils usually begins at the back of the head and radiates upward and forward. It is intensified by rapid movements, such as are occasioned by stooping and turning the head quickly from side to side. It usually is accompanied by a certain amount of dizziness. Headache and dizziness are frequent accompaniments of chronic suppurative otitis media and one may easily be led into error by assuming, unwittingly, that the source of these symptoms is the ear. A combination of diseased tonsils or diseased nasal accessory sinuses or both with chronic purulent middle ear disease is quite common. In the case of tonsil or nasal accessory sinus disease, the places at the base of the skull, where the muscles are attached are usually decidedly tender, and this tenderness is not confined to a particular side, but extends from one mastoid tip in a continuous line to the other. This is a differentiating sign and is found particularly in cases of diseased tonsils; it is what the late Dr. Isaac Adler aptly termed chronic indurative rheumatism. The headache of chronic aural discharge may be more intense on the side of the lesion than in other parts of the head, but in the great majority of instances patients are inclined to complain that the entire head hurts.

Chronic fetid aural discharge accompanied by cephalalgia and attacks of vertigo is sufficient indication for surgical attack on the mastoid bone and middle ear, if the headache and vertigo can be definitely laid to the door of the aural disease. In such cases it is not necessary that the hearing be markedly reduced; a good audition under such circumstances should be no deterrent to operative interference.

It should be distinctly understood that the radical

mastoid operation should never be undertaken unless the condition of the cochlea and the static-kinetic labyrinth be investigated, for it would be extremely unwise to operate on an ear in which there is a latent chronic suppurative labyrinthitis without at the same time doing a labyrinthectomy, as the ordinary channels of drainage would ultimately be closed and by this token serious intracranial complications from the diseased labyrinth would be fostered. Because a patient is found to have a dead labyrinth in association with aural discharge, there is, to my mind, no indication that a radical mastoidectomy and labyrinthectomy should be performed, unless there is evidence of meningeal irritation.

On testing the function of the semicircular canals on a normal individual, past-pointing, due to the vertigo produced, conforms to the physiological reactions as demonstrated by Barany. However, it very often happens that abnormal past-pointing is elicited in cases of chronic purulent otitis media of long standing. These abnormal reactions may be an inability of the patient to past-point inwardly or outwardly with either hand. In connection with this, in some cases the responses from the vertical semicircular canals may be very weak or entirely absent. The significance of these findings has not been explained satisfactorily. However, it is not evidence that the patient has a gross pathological lesion of the cerebellum or midbrain, but is suggestive of a localized plastic inflammation of the ependyma and meninges resulting from extension of the diseased process in the temporal bone by continuity or from toxic absorption from the diseased area. Evidence of a fistula of one of the semicircular canals is a strong indication for the performance of this operation.

Polypi, when large and obstructing a view to the middle ear, are an indication for the radical mastoid operation, because they are suggestive of definite disease somewhere in the middle ear spaces or mastoid, and it is well nigh impossible to determine whence they arise. The removal of polypi by means of a snare is fraught with danger because a certain amount of traction is necessary for their complete removal, and if these masses are attached to the footplate of the stapes, or the round window, or any of the semicircular canals, it is possible that the traction may be sufficient to dislodge small portions of bony capsule of the inner ear that are diseased and thus open up an avenue for bacterial invasion of its spaces.

The evidence of cholesteatoma in the middle ear and mastoid is generally considered to be an indication for the performance of this operation. It is very often possible to observe grayish white masses through perforations in the drum. This, when accompanied by foul discharge and the finding of cholesterin crystals therein, is sufficient evidence that this condition exists. However, it is not in every case of cholesteatoma that the crystals are found in the discharge, even though repeated examinations have been made. A roentgenogram of the mastoid bone by a competent roentgenologist will disclose the evidence of bone resorption around a cholesteatomatous mass. In the great majority of cases of chronic purulent otitis media which come to operation, small or large cholesteatomatous masses are found and it is only when the growth becomes large and endangers the intracranial contents and labyrinth by pressure necrosis, that it becomes an absolute indication for this procedure.

The destruction of portions of cortex of the temporal bone with the formation of fistulous tracts which drain either through the mastoid cortex or through the posterior bony wall of the external auditory canal, constitutes a definite urge for operative intervention as will be seen in the following case report.

S. L., female, aged 9 years, born in Greece. Had scarlet fever at the age of six, which was complicated by double otitis media. Both ears continued to discharge, the left more than the right. On February 12, 1922, a swelling was noticed over the left mastoid. The swelling was tender, but not red or edematous, but gave a sense of fluctuation on palpation. The discharge from the ear was foul, the drum membrane was absent in its lower portion. The hearing was markedly diminished. There was no evidence of vestibular irritation or incoordination.

On the same evening, a left mastoidectomy was performed. On cutting through the skin and periosteum, a large quantity of pus was evacuated. The external mastoid cortex was intact, but there was a large perforation through the posterior bony wall of the external auditory meatus through which pus exuded and had caused a necrosis of the contiguous membranous portion of the canal.

The mastoid was of the pneumatic type, the sinus plate was eroded, and the tegmen of the antrum was soft and granulations were found on the dura. Cholesteatomatous material was found in the mastoid antrum and it was thought advisable to perform a radical operation, which was done in the usual manner.

About eighteen hours after the operation the patient developed vertigo, nystagmus, nausea and vomiting, which lasted for about six hours and then subsided. This was probably due to the tightness with which the packing was placed against the promontory. After this, the patient made an uneventful recovery. She was seen about six weeks later, when the wound in the middle ear was completely healed and the hearing on that side was 3 feet to conversational voice.

An acute exacerbation of a chronic purulent mas-

toiditis is an indication for immediate operation because of the fact that the tissues and confines are primarily weakened by the already existing disease and with the advent of a superadded infection, the protective barriers are likely to be broken through and the inner ear or intracranial contents invaded.

Evidence of obstuction to drainage from the middle ear and mastoid in a case of chronic suppurative mastoiditis is a strong indication for this operation. Pressure symptoms may be manifest by the advent of a marked reduction in the hearing, vertigo, or a combination of both due to pressure upon a weakened capsule of the inner ear or a fixation of the stapes by accumulation of purulent material in the middle ear spaces. The appearance of drowsiness when the discharge from the middle ear ceases and a feeling of well-being when the discharge is resumed is suggestive of an abscess either on the outside of the dura or an abscess between the dura and the brain which has a fistulous tract with an outlet into the middle ear. The two cases that follow are good examples of this condition.

Mrs. E. J., aged 26 years, October 10, 1921. Had had a discharge from the right ear since childhood. The discharge had been intermittent, there being long periods when it was not evident. For the past eight months the ear had been discharging constantly, but not profusely. The patient had had headaches almost every day, and dizziness occasionally.

There was a large perforation of the inferio-posterior portion of the right drum, and the discharge, although scant, was fetid. Spreads of the discharge revealed Gram-positive cocci, epithelial cells, and no cholesterin crystals. All of the attachments of the muscles at the base of the skull including the sterno-cleido-mastoid were exquisitely tender. The tonsils were large and the crypts contained many cheesy concretions. An examination of the hearing revealed that the "Weber" was referred to the right, the low tone limit of the right ear was raised above 48 double vibrations. The Rinné test was negative. Conversational voice heard at 9 feet on the right side, 40 feet on the left. Whispered voice was heard 3 feet with the right ear, 15 feet with the left. The high tones were heard equally with both ears.

In consideration of the fact that the right ear was a serviceable organ by virtue of the result of the hearing test, and the tonsils were diseased, probably being the cause of all the symptoms, the tonsils were removed under ether anesthesia and in a comparatively short time the headache and occasional dizziness disappeared.

About four months later, the patient complained of headache, slight vertigo, nausea, and when the discharge from the right ear ceased the patient felt drowsy. When the ear began to run again the drowsiness disappeared.

Examination of the vestibular apparatus demonstrated that the patient past-pointed spontaneously to a slight degree with the left arm to the right, and on attempt to overthrow backward, the pelvic girdle reaction was not prompt. There were no other spontaneous phenomena. On turning to the right with the horizontal semicircular canals parallel to the floor, she developed a large nystagmus of 25 seconds duration, to the left. The same result was obtained on rotation to the left, except that the nystagmus was to the right. On rotation to the right, with the vertical canals on the horizontal plane, she fell markedly to the right. On rotation to the left in the same position she fell slightly to the left. On rotation to the right, she past-pointed 12 inches to the right with the right hand, and with the left past-pointed slightly to the left, and then 4 inches to the right. On rotation to the left, the past-pointing was found to be normal. Caloric reaction was not tested.

The *x*-ray report by Dr. Frederick M. Law was as follows: "The right mastoid is undeveloped and shows some sclerosis around the knee. There is a small area below the knee, between the anterior wall of the sinus and the posterior canal wall, which shows bone absorption. The region around the antrum shows organized tissue, with some bone absorption below the tegmen which suggests cholesteatoma. This is evidently a chronic ear [infection] with some bone absorption. The left mastoid is small and clear."

In view of these findings, it was felt that when the discharge from her right ear stopped it accumulated and caused pressure symptoms, and a radical mastoid operation was performed. The bone was very hard and very few cells were encountered. The mastoid antrum and the area between the posterior wall and the lateral sinus contained cholesteatomatous material. The sinus plate was necrotic at the knee, and the dura of the middle fossa was exposed for an area about the size of a dime. The dura was opaque and covered with slimy material and was definitely separated from the surrounding bone.

About 18 hours after the operation, the patient developed nausea, vomiting and vertigo accompanied by a rotary nystagmus to the opposite side. During the severity of this attack, which lasted for about 8 days, the patient lay constantly on her left side with the eyes turned to the right. About the fifth or sixth day her hearing was tested and she was found to be stone deaf in her right ear. From that time on the patient made a rapid recovery and left the hospital at the end of 16 days. Although still dizzy, she was able to walk without assistance and each day showed a progressive improvement. It was felt, however, that we were dealing with an acute suppurative labyrinthitis which at any time might manifest itself by meningitis or brain abscess.

About 6½ weeks after the radical mastoid operation, the patient began to complain of pain in the right side of the head which became very severe at the end of three days. During the day she had a dull headache, but at night this became so intense that she was prompted to pull the hair out of her head in desperation. Definite tenderness of the skull on the right side above and back of the ear was elicited. A small drop of creamy pus was always present in the ear about the internal tympanic wall. There was

no nystagmus and she past-pointed spontaneously 3 inches to the right with the right arm and touched with the left. There was a definite tendency to fall backward with the eyes closed while standing upright.

A neurological examination was made by Dr. Marcus Neustaedter and he reported as follows:

"Blood pressure, maximum systolic 118 mm. Hg.; minimum dyastolic 90. Pulse 108. Temperature by mouth 99.5°. Pupils, small; react promptly to light and accommodation; fundi, right negative, left shows an old hemorrhage in the retina. Patellar reflexes; right, 1 plus; left, 2 plus. Pharyngeal reflex absent. There is some swaying on standing with eyes closed, but no true Rhomberg sign. A slight right facial paralysis, especially in the lower quadrant, is manifest, also a motor weakness in the right masseter and pterygoid muscles. The uvula assumes a diagonal position to the left. A left hemiparesis is apparent. Diagnosis—basilar meningitis and possibly a temporo-sphenoidal lobe abscess."

The cerebro-spinal fluid revealed a slight turbidity; globulin, 1 plus; Fehling, 1 plus; Wassermann, negative; cultivation, negative; 500 cells to the cubic mm. On the day following the cells increased to 1040, and the fluid remained sterile.

On the same day she past-pointed spontaneously with the left hand slightly to the right. The right ear remained stone deaf, good hearing was evinced in the left ear. No response was obtained from douching the right ear with cold water. On douching the left ear, no nystagmus or past-pointing was elicited with the head upright, but with the head tilted backward, a large horizontal nystagmus to the right developed, but no past-pointing was elicited in this position.

Dr. John McCoy was called in consulation, and it was agreed between us that as long as the number of cells in the cerebrospinal fluid had increased to such an extent in twenty-four hours, and the nystagmus showed no signs of abatement immediate labyrinthectomy was indicated. It was performed that day by Dr. McCoy with Dr. Gottlieb assisting.

The Hinsburg operation was done. A very small dark area was found just above the prominence of the external semicircular canal which looked like an area of necrosis. When a ring curette was passed over the internal tympanic wall from below upward, the face was seen to twitch several times, which indicated that the facial nerve was exposed either anomalously or as a result of bone destruction. The uncapping of the external semicircular canal was begun at the place where the fistula was found and in using the curette in a downward direction, a fairly large piece of bone was slivered off the internal end of the posterior bony wall of the external auditory canal and it was feared that the facial nerve was either exposed or completely severed. Fearing that possibly this patient might later show signs of abscess of the cerebellum, a decompression of the posterior fossa was done at the same time. The day following the operation, a complete facial paralysis of the right side was found, with the exception that the patient could partially close the right eye. On the same day, the number of cells in the cerebro-spinal fluid decreased to 450, and from that time on she made an uneventful recovery.

Miss A. M., aged 26, born in Poland. Family and previous history bear no relation to the present illness except that since childhood she has had intermittently a discharge from both ears.

On first examination, her right ear showed evidence of chronic inflammation; the drum was scarred and distorted. The left ear was discharging muco-purulent material which exuded from a large perforation in the lower half of the drum which included the margin. No evidence of denuded or roughened bone could be elicited by the probe. The left antrum was cloudy and the left ethmoid was found to be definitely diseased by virtue of the fact that the middle turbinate was very large, and large quantities of muco-purulent secretion were constantly found in the middle meatus and in the spheno-ethmoidal recess. It was felt that the nasal disease was instrumental in keeping up the aural discharge and the left ethmoid and sphenoid were therefore exenterated. As the result of the operation, the discharge from the left ear gradually diminished, but did not cease completely. The hearing on both sides was diminished about half the normal.

She was not seen for about 5 months and then she contracted an acute ethmoiditis of the right side with profuse discharge, it being sufficiently irritating to excoriate the anterior nasal orifice and upper lip. She complained at this time that her hearing was markedly reduced, and on examination, webs were found in both auditory canals, completely occluding their lumens. The web in the left external auditory canal was found to be a few millimeters external to the position where the drum ordinarily is. It was bulging outward, not red or inflamed, but gave every evidence of having fluid behind it. The web in the right external auditory canal was situated about half way between the middle ear and the external auditory orifice. It was dull and when its surface was scraped, a thin necrotic membrane easily stripped off its surface, leaving a glistening pearly gray membrane behind it which could easily be mistaken for a tympanic membrane, except for the fact of its abnormal position and the absence of the usual anatomical landmarks which are present in the normal tympanic membrane. The left web was broken through and crushed as much as possible and a small quantity of thick viscid material was liberated. In the course of a few days, the irregular margins of the web had adherred to the margin of the old perforation, and the usual discharge from the ear was reestablished.

The adventitious drum in the right external auditory canal presented a far more difficult problem. It was cut through and crushed to the sides and muco-purulent material was found behind it. Plugs of cotton saturated with iodo-glycerine were tightly packed in the orifice for the purpose of preventing a reunion of the frayed edges of the membrane. This procedure had to be abandoned because it was found that the packing prevented drainage from the middle ear and gave the patient headaches and dizziness. Cauterizing the edges of the opening in this web

with trichloracetic acid and strong silver nitrate had very little effect in preventing the membrane from growing again, and after a short time a small perforation in its center remained through which large quantities of muco-purulent discharge exuded. When the discharge was wiped away, that which remained proximal to the adventitious drum could be seen to distinctly pulsate through the orifice.

This continued for about a month when the patient began to have headaches, dizziness and attacks of syncope. It was then felt that something radical ought to be done and preliminary to a radical mastoid operation on the right side, both mastoids were *x*-rayed, the hearing retested, the vestibular apparatus investigated by turning only, as it was felt that douching the right ear would not produce vestibular reaction by virtue of the fact that the adventitious drum would interfere with the cold water reaching to the middle ear. In addition, her cerebro-spinal fluid was examined.

Dr. Frederick M. Law reported his *x*-ray findings as follows: "The right mastoid is non-cellular and shows sclerosis posterior. The emissary vein is extremely large. The region between the sinus, the posterior canal wall and the tegmen, contains dense granulations of organized tissue, and there is an area of absorption occupying this region. The left mastoid is non-cellular posterior to the sinus. The region between the sinus, the posterior canal wall and the tegmen, is principally occupied by dense organized tissue. There is a slight area of absorption between the sinus and the posterior canal wall. Both are typical chronic mastoiditides."

The lower tone limit in the right ear was raised above 256 double vibrations; the high tone limit was normal; the Rinné test was negative, and the conversational voice was cut down to 1½ feet. The watch test was negative. The lower tone limit of the left ear was raised above 128 double vibrations; the high tone limit was normal; the Rinné test was negative, and the conversational voice was heard at 4 feet. The watch test was negative.

The patient did not show any spontaneous nystagmus, past-pointing or falling, nor was evidence of incoordination elicited. On rotation to the right, the duration of the nystagmus was 13 seconds, while on rotation to the left, the nystagmus was 21 seconds. On rotation to the right, she past-pointed slightly to the right with the right arm, and then to the left, and slightly to the left with the left arm. Falling was not elicited on rotation to the right, but was easily demonstrated on rotation to the left.

The cerebro-spinal fluid was found to be normal.

The usual Schwartze-Stacke operation was performed on the right ear, and a small quantity of cholesteatomatous material was found in the region between the sinus and posterior canal wall and in the mastoid antrum. The patient made an uneventful recovery.

The advent of facial paralysis as a complication of chronic suppurative otitis media is a definite indication for the performance of the radical mastoid operation. Facial paralysis, either mild or severe, may occur during the course of mild catarrhal inflammations of the middle ear. However, the condition is transitory and usually not complete, and not dependent upon necrosis of the Fallopian canal. When the facial paralysis occurs during the course of chronic purulent otitis media, it can be considered a serious complication because of the fact that the Fallopian canal runs in close proximity to the internal ear, and it may be presumed that the semicircular canals may be in danger of invasion by the same process. It is therefore to be considered as an indication for a prompt and careful operation.

43 WEST 69TH STREET.

HEMI-ECTROMELIA: A CASE REPORT AND BRIEF REVIEW OF THE LITERATURE.

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Ancient medical history contains descriptions of hundreds of fantastic congenital departures from normal anatomic conformation, exact counterparts of which are not disclosed by careful search of more modern literature. It is interesting to note, however, that some equally curious *lusus naturæ* are occasionally observed, and the case herein recorded enjoys the distinction of being thus classified.

While congenital errors of anatomic development have been studied since the time of Aristotle (360 B. C.), it appears that Geoffroy Saint-Hilaire (1835) was the first to attempt scientific grouping and classification of the various teratisms. Our knowledge of the subject was further enriched and illuminated by Hirst and Piersol in their Atlas of Human Monstrosities published in 1892.

It may be of interest, in this connection, to define a few of the developmental defects which have been noted in the extremities:

Agenesia: Absence or imperfection of parts; failure of skeletal development;

Hypoplasia: Abnormal smallness of a part; partial deficiency of growth;

Ectromelus: A monster with aborted or imperfect limbs; no limbs; rudimentary limbs; stumps of limbs. *Hemiectromelia* is the term used to denote the anomaly when unilateral;

Hemimelus: A monster with perfect upper arms and thighs but with distal portions deformed;

Phocomelus: A monster with shortened or rudimentary arms and thighs the hands and feet being attached almost directly to the body;

*Died October 14, 1922.

Sympus: A monster with fusion of the lower extremities usually accompanied by other abnormalities.

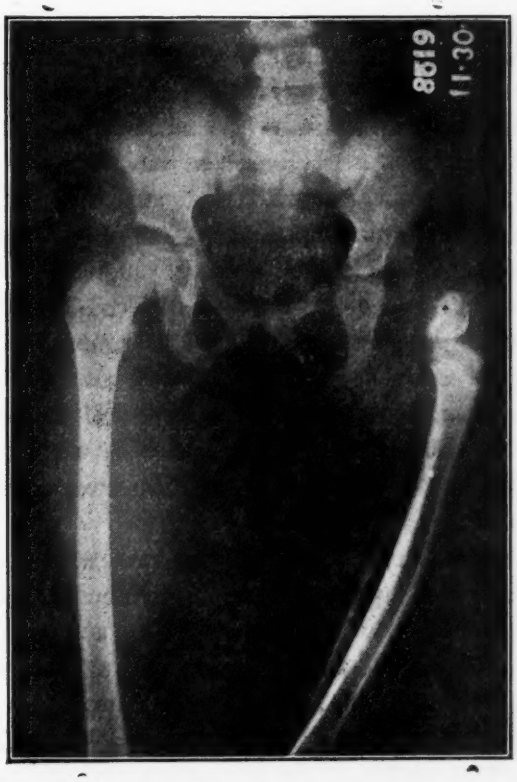
A child now under our observation who presents a typical example of the congenital effect of anatomic conformation known as hemi-ectromelia furnishes the incentive for this review. So far as can be ascertained by investigation and inquiry no other deformity of this type has been observed in Kentucky; and search of available literature reveals the record of only five similar cases. The latter are excerpted and appended hereto. The history of our personally observed case is briefly reported merely as a rare and interesting anomaly.

G. A. N., female, colored, aged 7 years, the first and only child. The mother is healthy and about 25 years of age; her labor was normal so far as known; there is no history of any other deformity in the family.

This child is healthy and well nourished; her intelligence is normal for her age and race. Roentgen-ray examination shows that her osseous system is perfect except for absence of the left femur and a portion of the left fibula; bones of the foot and tibia normal; fibula and patella rudimentary. The child walks and plays by standing on the foot of her short extremity with the knee of the normal one flexed in a kneeling position, the short leg being about the same length as the thigh of the normal side. Well developed glutei muscles are attached to the shaft of the tibia. The photographs herewith clearly show the character and degree of the anatomic defect.

The only remedial measure to be suggested would be amputation of the left foot with adjustment of an artificial leg to the resulting stump. However, this hardly seems advisable now on account of the muscular development.

There exists little authentic information concerning the factors which are actually operative in the production of anatomic developmental errors. Many of the older observers held seminal deficiency or superfluity accountable, and the ideas expressed by certain more recent writers seem equally ridiculous and unscientfic, e. g., some text-books authors have claimed that maternal impressions were responsible for the origin of practically every type of congenital deformity; others have attempted to explain anomalous development upon the apparently simple theory of "embryonic malformation;" but the latter utterly fails since the cause of the embryonic change still remains unknown. According to Piersol: "previous explanations of the production of monstrosities consisted of confused and fanciful assumptions, often grotesque in their absurdity, in which supernatural influences, the benign or baneful exercise of divine power, the impressions wrought by heavenly bodies, the blighting influences cast by unholy spirits and by witches, sexual congress with the lower animals or with Satan himself—'coitus cum diabolo' being accepted as an important factor even as late as Martin Luther (1500) and ambrose Paré (1560)—all found accredited place in the category of potent causes of monstrous births."



At one time the birth of a monster, human or otherwise, was regarded as an "omen"—i. e., "a prophetic manifestation of the impending wrath of providence," which markedly enhanced theologic

and historic interest in such abnormal occurrences. "And the hankering after the mysterious and inexplicable which has always formed so preeminent a characteristic of man, has successfully popularized the most preposterous explanations of the genesis of prodigies of every type and class." The numerous varieties of monsters described by Aldrovandus and Paré show the "riotous intellectual ingenuity of medieval superstition."

The diffusion of embryological and teratological knowledge has somewhat lessened the mystery which formerly surrounded the etiology of congenital defects, but many of the ancient superstitions still obtain. For example, in certain quarters malformations of every description are even yet universally attributed to the effect upon embryonic tissues of grave maternal impressions, i. e., exposure of the pregnant woman to shocking sight or accident. It seems probable that careful anamnestic inquiry would reveal that in every instance the so-called "impression" was received too late in gestation to produce any alteration in fetal structure. Landau remarks "maternal impression is and remains a superstition, and despite Welsenburg's highly instructive work on the subject, it has not become worthy of scientific recognition." Lewis attributes all teratological developments to "physical and mechanical causes entirely remote from psychical influences," and his views are amply supported by artificial production of monstrosities in laboratory investigations.

Other etiological factors that have been accorded more or less prominence are: profound shock during first days of gestation, poverty and want producing fatal anemia, consanguinity of parents, incestuous connections, etc. It is especially emphasized by Barnes that consanguineous marriages are important factors in the production of monstrosities. However, there are good reasons for believing the marriage of near kin has no more effect than the influence of so-called maternal impressions or heredity.

Based upon present understanding it seems reasonable to divide the determining etiological factors concerned in the production of congenital defects of conformation into two general groups, viz., (1) internal or intrinsic, and (2) external or extrinsic.

Among internal causes may be mentioned defective constitution of the germ-plasm whether modified by inherent peculiarities of one or both parent-cells, by pathological changes affecting the embryonic organism, or (rarely) by impressions due to heredity or atavism. It must be remarked, however, that the proposition of defective parental germ-cells merely represents a theoretical assumption because demonstration of structural variations producing deleterious effects upon the developing embryo is manifestly impossible. "The apparent influence of heredity with reference to particular defects has long been recognized, supernumerary fingers and toes, harelip, skin pigmentations, etc., occurring in certain families through successive generations; and graver abnormalities, including hypospadias, imperforate anus, spina bifida, microcephalus, and partial absence of limbs, also seem influenced by transmitted disposition." (Coleman.)

External causes are believed to be more important. They may be mechanical, such as traumatism and pressure, or physio-chemical, such as variations of temperature, electricity, deficient oxygen, toxics, and maternal influences. External violence may cause impaired nutrition and arrest of development from separation of fetal and maternal tissues due to extravasated blood. Slight pressure long continued early in gestation may induce profound fetal changes.

"The intimate relationship between the amniotic envelope and the embryo (especially the cephalic end) renders abnormal diminution of the amniotic space serious in the early stages of embryonal development, and may induce defective conformation of various cerebral segments, the eyes (cyclopia) or parts formed by the visceral arches. Certain types of deformities of the skull (cranioschisis) and of the spine (rachischisis) are probably due to amniotic pressure. Likewise, development and differentiation of the caudal extremity of the embryo may suffer, the immature lower limbs remaining stunted (phocomelus) or unformed, or be early so blended that their future development gives rise to a compositive member (symelus or sympus)." (Coleman.)

Other extrinsic influences are: jarring and contraction of the uterus, pressure from uterine or pelvic neoplasms, dislodgment of the ovum, partial placental separation and hemorrhage, uterine and placental disease, maternal diseases, disturbance of oxygenation and nutrition, intoxications, infections, etc. Amniotic abnormalities and adhesions, oligohydramnios and polyhydramnios may cause an infinite variety of fetal malformations.

In discussing ectromelia, or the condition of absent or defective limbs, Jansen (as quoted by Lewin) has the following to say: The question remains, how can the extremities be thus injured, while the trunk remains unchanged although exposed to the same (amniotic) tension? In the extremities the

cartilage develops later than in the trunk; when in the sixth week the cartilage has been formed in the spine, the skeleton of the limb-buds still consists of that dense connective tissue known as scleroblastema. And it is easy to imagine a pressure which is able to affect the latter, fixed between amnion and trunk, to drive the blood out of them either partially or wholly, depriving them of their nutrition, while the skin as an older formation and in a condition of less active growth is little or not affected. The lower extremities, more exposed by their position and, moreover, backward in development compared with the upper, suffer most; and their button-shape seems to still bear the stamp of the direction in which the amnion pressure has acted. The upper extremities, affected more indirectly by the hour-glass-shaped narrowing, to which every distended elastic bag tends in the middle of its length, are pressed against the trunk. A disturbance of the circulation in a space of 2 mm. here means destruction of the peripheral half of the extremity. And the conical shape of the surviving stump seems to indicate that the disturbance of circulation gradually diminishes from the periphery to the center.

The injury which the amnion may cause to the embryo is: (1) greatest in the stage of the non-differentiated mesoderm, viz., in the first two weeks (the first stage of development of the skeleton); (2) less in that of the dense scleroblastema, from the third to the sixth or eighth week (the second stage of development of the skeleton); (3) least after the eighth week, when the whole of the skeleton consists of cartilage and bone (the third stage of development of the skeleton).

It may be considered probable that the amnion has the power of destroying deep-lying parts in a perfectly normal embryo—either with or without simultaneous injury to the skin. The same direct pressure which is unable to deform cartilage may compress scleroblastema, squeeze the blood out of it and deprive it of its nutrition. If the cartilage stage is that in which various forms of kakomelia may arise, the beginning of the cartilage stage is specially fitted to cause various forms of kakomelia in which bones are lacking. (Jansen.)

Jansen (Lewin) concludes: (1) The achondroplastic is an amnion-dwarf, ("folded up by a dwarf amnion,") caused by the enhanced hydrostatic pressure of which it has been disturbed in the development of its skeleton; and that (2) the wonders of anencephaly, achondroplasia, and many forms of kakomelia may be easily understood and arranged in chronological order, if we accept the principle that: amnion-pressure is able to disturb the nutrition and growth of part of the embryo, while the non-affected parts continue their growth. (Jansen.)

It is believed that the amnion-pressure theory accounts for the greater number of congenital defects of development. In certain instances (percentage unknown) absence of anomalous development of the long bones may be due to some defect in the anlage of the skeleton. Nothing further need be said concerning heredity and maternal impressions.

According to Gaenslen, as quoted by Lewin, the theory most widely accepted today is that these bone defects are due to pressure of amniotic bands, to adhesions between amnion and fetus, or to pressure on the developing fetus from an amnion which is too small.

After critical examination of many cases, Wilder attempts to bring under one general law the entire series of symmetrical monsters, both "monsters of defect" and "monsters of excess." He claims that all bilaterally symmetrical vertebrate bodies, of both usual and unusual forms, develop in accordance with orderly laws of their own and are termed "cosmobia," i. e., orderly living beings, as distinguished from deformities or lawless aberrations of development. Cosmobia may be normal beings, or abnormal, or unusual. Some of the abnormal cosmobia are less than typical individuals ("monstra in defectu"); some of them more than single individuals ("monstra in excessu").

EXHIBITS.

The following data are excerpted from the admirable book of Gould and Pyle on Anomalies and Curiosities of Medicine:

"Those persons born without limbs are either the subjects of intrauterine amputation or of embryonic malformation."

In the Musée Dupuytren there is preserved the skeleton of an individual known as "Pepin" who died at sixty-two. He had no arms, legs nor scrotum, but from very jutting shoulders on each side were well formed hands. His abdomen ended in a flattened buttock with mal-formed feet attached.

Flachsland mentioned a woman who had three times borne children without arms or legs. Garlick saw a living male child with neither upper nor lower extremities; in their place there were stumps three or four inches long; head, chest, body and genitals well-formed.

Hutchinson recorded the history of a child born without extremities probably the result of intrauterine amputation. The flaps (or stumps) were

healed at the deltoid insertion and just below the groin.

Paré described a man without arms, who by means of his head and neck "could crack a whip or hold an axe." He ate with his feet, dealt and played cards, and threw dice with the same members. The same author mentioned a boy of nine who had no legs and whose left foot was represented by a fleshy body hanging from the trunk; he had but two fingers on his right hand; between his legs there was what resembled a virile penis. Also a woman who sewed, embroidered, and did other things with her feet.

Jansen saw a man born without arms who could use his feet as well as most people do their hands. Schenck and Lotichius also described armless individuals.

Hulke observed a child whose upper limbs were absent. He had free movement of the shoulders and could grasp objects between his cheeks and his acromin process. A monster of similar conformation was the celebrated painter, Ducornet, whose history is familiar to the majority of those who have studied this subject.

Broca described a man who had no arms and only one leg. He exhibited great dexterity with his single foot, wrote, discharged a pistol, etc.

Capitan recorded the history of a man without arms who was said to play the violin and cornet with his feet. He was able to take a handkerchief from his pocket and blow his nose; could make a cigarette, light it and put it in his mouth; play cards, drink from a glass, eat with a fork, etc., by the aid of his dexterous toes.

There was at one time exhibited in France a creature who was called "l'homme tronc." He was minus all his extremities. Curran observed a Hindoo female of forty with congenital absence of both upper extremities who performed many tricks with her toes. Monsters without arms were mentioned by Caldani, Davis and others. Breschet saw a child of nine without portions of the upper arms and deformity of the lower extremities and pelvis.

Hare observed a boy whose head and trunk were apparently normal but was devoid of lower extremities. The right arm two inches long, the left two and one-quarter. Each contained the head and a small portion of humerus. The legs were represented by masses of cellular tissue and fat covered by skin which projected about an inch. A boy with congenital deficiency of the lower extremities was at one time exhibited in Pennsylvania, and the Mutter Museum contains a photograph of a similar case in a girl.

Buhl described a woman with congenital absence of both femurs and both fibulas. The thigh muscles existed the main attachment to the pelvis being a large capsular articulation. Charpentier showed the portrait of a woman in whom there was uniform diminution in size of the limbs. Debout mentioned a young man with almost complete absence of the thigh and leg from whose right hip there depended a foot. Accrell saw a man born without hip, thigh or leg on the right side. The external genital organs were in their usual place but there was only one testicle in the scrotum. The man was said to be virile.

Jewett (1890) referred to a fetal monstrosity in which there was absence of one lower extremity, and of the other only the thigh and tibia were present. There were no genital organs. Both hands were "clubbed."

McNamara (1898) saw an infant of six months with the following deformities: the left arm was absent from the middle third and the right from the elbow with the exception of a rudimentary finger on which there was a finger-nail; one lower limb was absent from the knee-joint, while the other was poorly developed with foot twisted backward. The mother had had a miscarriage when married one year, during the fifth or sixth month of gestation, and the father stated that this fetus was also deformed, the lower limbs being fused and the genitals placed on one side.

Cleeman (1898) described a child presenting "anomalies great enough to be placed in the group of monsters according to the classification of Geoffroy Saint-Hilaire." The femurs were entirely absent or in such a rudimentary condition that they could not be distinguished without dissection; the legs were apparently articulated directly upon the pelvis. The feet were turned upward and outward but were readily placed in proper position by manipulation. The penis and scrotum were perfectly formed.

Lloyd mentioned having under his care, at the Home for Crippled Children (Philadelphia) in 1898, a girl with complete congenital absence of both lower extremities. They were represented simply by small fleshly tabs at the hips. (This is probably a duplicate of example from Gould and Pyle, v. i.).

Stouffs (1899) saw a monster with double harelip and imperfect development of both lower extremities. The hands (consisting of three fingers) were joined to the clavicles and scapulæ by single bones. The long bones of the legs were absent, a single center of ossification representing the tarsus. The

feet were perfect except for webbing of the fourth and fifth toes. The four extremities resembled those of a seal.

Cotton (1901) recorded a case in which roentgen-ray examination showed but one bone in each extremity—probably the humeri and femora. The hands and feet were distinctly "clubbed" and partially webbed.

Mummery (1910) described a male child of two years with absence of the left femur. The knee-joint appeared normal but was close to the hip; below the knee the leg was normal but rotated outward. The roentgen-ray showed the diaphysis of left femur missing, the lower epiphysis being present, with a small island of cartilage above. The child showed no other defect and was healthy.

Thomas (1913) reported total absence of the femur in an infant of three months born of a syphilitic mother. The child showed signs of congenital syphilis shortly after birth. The leg defect was quite noticeable from the beginning; roentgen-ray examination revealed the anomaly.

Maguire (1914) referred to a female child with one knee-joint quite close to the hip as if there were no femur intervening between upper end of tibia and acetabulum. The leg and foot were thin and small from non-use but otherwise normal; the foot reached to about the level of the knee of the normal limb. Standing beside an ordinary chair the child could support herself by placing the short leg on the chair seat. The affected leg was about eighteen inches shorter than the other.

Dachtler (1917) mentioned a child aged six months whose right thigh was short and thick but on examination seemed to have a normal knee-joint. There was excessive mobility of the right hip. Roentgen-ray investigation showed the femur absent with the exception of a round mass the size of lower femoral epiphysis at corresponding age just above and apparently forming part of knee-joint. There was no deformity of the pelvis and the acetabulum appeared normal. There was no evidence of an epiphysis for head of the femur.

Harrison (1919) related the history of a primipara who was delivered of twins. Both children seemed in good condition, but baby number two had a short right thigh, so short in fact that the right knee appeared to articulate with the ilium. The right leg was freely movable at the knee-joint. The left leg and thigh were normal. There were no other deformities. Roentgen-ray examination showed absence of right femur and the fibula was very small compared with the left.

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REPORT AND CRITICAL ANALYSIS OF A LONG-STANDING CASE OF INTESTINAL SPASTICITY, WITH OBSERVATIONS ON THE BENEFICENT USE OF ATROPINE.

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At a conference on March 16, 1922, anent a case of singultus of a week's duration, Dr. Jacob Kaufmann gave a synopsis of his address on the subject of spasticity, which was read subsequently (in Washington, May, 1922) before the American Gastro-Enterological Association. This conversation was continued March 20, 1922, at a second conference in the case of a patient 55 years of age, under my personal observation since 1889 for periodical abdominal distress, intense headaches and symptoms simulating left renal colic.

Characteristic throughout the patient's life was the periodicity of dyspeptic symptoms, increased distress with, and even in anticipation of, bowel movement, persistence of pain between movements when several occurred the same day. She felt better during these periods on a day when there was no bowel movement at all.

To determine, if possible, the central origin of these various manifestations, patient was referred, with history, to Dr. Bernard Sachs who reported January 5, 1901, a predominating element of spasticity.

The customary laboratory examinations of the day were made, affording, however, no definite clues. Hypo- instead of hyper-chlorhydria was found at times when the latter was expected. Bloody evacuations (melena) never noticed. On a few occasions

a small amount of light red blood, from hemorrhoids, recorded. Food intake did not occasion immediate distress,—stomach ulcer was excluded. Cholecystitis was not even surmised, though even then already on the watch for anomalous gall-bladder possibilities. Patient's mother suffered from them for a number of years, the bladder suddenly rupturing on one occasion with immediate intense icterus, collapse and death.

In accordance with the routine of the day, bromides, codein and belladonna (with recollection of favorable action of latter) were given with care and always with comforting assurance of a remission to follow.

With the dawning of the duodenal day, came a most welcome modernization of the previously obtruse first decade of observation. The second period was marked by an increase in distress, shorter remissions, dread of drug addiction, a quarter century of suffering, *x*-ray clarification, all impelling probative laporatomy at least.

X-ray report, January 9, 1914: "Extensive radiographic examination of Miss X. after administering 2½ oz. of bismuth subcarbonate in 10 oz. of cooked cream of wheat, reveals a stomach of moderate size, lying in mid-abdomen, the lower curvature being on a line with the umbilicus. Motility fair. Peristalsis of a *distinct spastic nature.* There is no evidence of ulceration or malignancy in the stomach proper. The first portion of the duodenum, or bulbus duodeni, which should properly fill, fails to show a proper outline. There are persistent deformities in the upper portion seen in all the radiographs. The deformities are probably the result of ulceration. There has not, however, been sufficient contraction to produce obstruction as the stomach goes on and empties itself freely in the normal six hours, the head of the bismuth column being in the beginning of the cecum.

"Thinking that possibly some ileal stasis might accompany our duodenal lesion, we examined the patient 24 hours after the bismuth meal. Defecation had occurred and the intestine was nearly completely empty of any bismuth remnants.

"Radiographic conclusions: We are dealing with an old duodenal ulceration with deformities and contractures. While it is difficult for us to say whether any ulceration exists at the present time, certainly duodenal irritation is present and is shown by the *spastic contractures* of the stomach. These conclusions are clearly arrived at from the radiographs presented."

Operation, April 24, 1914: Gall-bladder, with lumen completely obliterated, enmeshed entirely in duodenum; removed. Gastroenterostomy. Postoperative fever for 80 days. Phlebothrombosis, left leg. Abdominal distress, despite bowel movement, persisted, reaching climax two weeks after operation and leading to a surgical re-inspection of the peritoneal cavity with full acquittal; again sewed up. Pain by degrees lessened, then disappearing completely, giving way to an opposite picture: sensitiveness diminished, anesthetic to deep pin-pricks, mentally depressed, then less concerned, indifferent, finally completely oblivious of events and surroundings, almost motionless, artifically fed. Complete amentia, wide open eyes and occasional imbecilic yell of no determinable purport, the only evidences of existence,—all merely the anti-climax of the preceding spasticity, and indicating revisional laparatomy. It persisted for a few weeks coming gradually back to normal.

Remarks: 1. Diseased loop of intestine not having been resected, no statement possible as to its internal pathology, whether ulcer past or present. Likewise indeterminable whether duodenum was the organ primarily affected. *X*-ray picture could not give account of obliterated gall-bladder. 2. The post-revisional anti-climax has no counterpart in patient's whole history. All previous exacerbations of spasticity gave way to remissions until next exacerbations without a drop below normal.

With healthy mentality, a lack of self-indulgence and none of the stigmata of the psychic inferior, however characterized, a noteworthy minimum of professional attention throughout the past 33 years was accounted for. Spasticity as a quantity was overshadowed, even lost sight of, hampered by superconsciousness of physical defects.

November 1, 1914: Abdominal hernia noticed (diastasis recti) coincidentally with exacerbation of abdominal and cerebral distress, requiring occasional narcotic.

X-ray report November 23, 1915: "Stereo-roentgenographic examination of the genito-urinary tract fails to reveal the presence of nephrolithiasis." This examination made incidental to severe attack of renal colic requiring morphine injection. [In 1919 patient voided what appeared to her to be a concrement] it lacked, however, the hardness of stone and was lost before it could be examined. With the frequency of attacks, the constantly negative urine, the negative *x*-ray report, the non-passage of stone with the exception of the above mentioned doubtful occurrence, spasticity may here too have simulated a gross anatomical lesion.

Early in 1917 a new symptom,—very slight cyanosis of lips. No valvular lesion; normal urine.

June 20, 1917: Hurriedly summoned to bedside on account of intense abdominal pain with bowel movements. Patient apparently in extremis, lips and fingers deep blue, almost black, pulse exceedingly rapid, intermittent and irregular; body cold. Morphine and atropine injection changed the picture very rapidly stabilizing and reducing pulse frequency and spasm. June 21, 1917: Cyanosis marked, but diminished, pulse regular.

Subsequent events need not be detailed, and may be characterized as exaggerated replica of the past. Greater diastasis recti; increased need of opiates and fewer non-narcotic days; at times repetition of daily doses. Lips persistently cyanotic, and on rare occasions of intensified spasticity, narcotics hypodermatically. Operation for hernia with adhesions and

with cardiac symptoms was weighed against non-operation and threatened drug addiction. Operation was excluded on the coincidental post-operative death of another patient likewise under years of observation for large abdominal rupture following removal of pelvic tumor, with noticeable cyanosis of lips. Surgery and medicine had not the temerity to withhold narcotics, with June 20, 1917 in mind, despite the vicious circle possibility, even probability.

X-ray report, November 20, 1918:

"*Chest*: Marked bulging of right auricular region of the heart. Somewhat wavy and occasionally, somewhat irregular ventricular contractions. Aorta not dilated. Lungs show evidence of moderate fibrous degeneration around the roots.

"*Stomach*: Very marked irregular contraction at about middle of the stomach, resulting in an hour-glass stomach with two pouches. Emptying of both pouches through the gastroenterostomy stoma which evidently is situated at the contracted portion, goes on rapidly at the beginning, is delayed, however, later on. Stomach empties itself within 5 hours. Peristalsis very marked. Pylorus evidently excluded; very small portions of the contrast mixture, however, are seen to pass through it.

"*Small Intestine*: Negative, except as described above.

"*Large Intestines*: Marked prolapse of transverse colon. Marked looping of sigmoid. Motility normal, except for a slight retention in cecum 24 hours p. c. Appendix abnormally long, kinked, evidently fixed by adhesions. Points of tenderness: over appendix and descending colon. Most extreme tenderness corresponds to region of upper half of descending colon. Even very light palpation under the guide of the fluoroscope causes wild spastic contraction of that portion of the gut. No evidence of adhesions with exception possibly of the appendix.

"*Conclusions*: Hour-glass stomach most probably due to adhesion at the gastroenterostomy stoma. Appearance of changes suggest possibility of gastro-jejunal ulcer. Pathological appendix. Prolapse of transverse colon. *Extreme spasticity* of upper half of *descending colon.* Enlarged heart with suggestion of myocardial involvement. Enlarged liver. Fibrosis of lung."

Remarks: 1. Pathological appendix: If appendix is found pathological only by *x*-ray report, that is good reason for non-interference, and so avoid further troubles among which increased spasticity.

2. Possibility of gastro-jejunal ulcer: If such ulcer produced symptoms the latter would be referable to spasticity and not to jejunal ulcer, except merely as possibly underlying incident.

3. Extremely spastic condition of upper half of descending colon: valuable and to the point.

A week's observation early in March, 1922, brought about the conference of March 20th, on the subject of spasticity. Hope with reservation was about the mental attitude with which the patient was approached, leaving her nevertheless resigned to one of only two eventualities,—narcotics ad libitum or operation with questionable result or worse.

Treatment inaugurated after the conference: Atropine sulphate, 1:1000, 5 drops three times a day, increasing one drop to 15 drops three times daily.

March 28, the eighth day, patient reports improvement; lips far less cyanosed, no narcotics since atropine treatment was begun. Early in April met patient casually, cyanosis completely disappeared, the first time in five years. This same condition persists today, about three months after treatment began; feeling better continuously than in many years, and without pain.

Discussion: How much are these results referable to suggestion? Barring the specifics, the value of suggestion in internal medicine, combined with indicated, or even despite contraindicated, treatment is axiomatic. Spasticity, however, is force, not matter. Atropine is not indifferent and antispastic as well as antiopiate. Spasticity and opium eliminated, a seemingly unavoidable opium-vicious was converted into a motivated atropine-benign circle. Besides, after operation spasticity gaining more and more momentum, together with unknown factor *X*, and in the absence of any other plausible cause, cardiac degeneration ensued. This, too, was favorably affected. The total results are in appearance more akin to the action of quinine in malaria than to suggestion as such. Spasticity under control, suggestion did the rest. How much might it have availed and averted at 22 when still young and without three decades of suffering?

Conclusions: 1. A conviction that spasticity was a prime and independent factor throughout the whole history despite underlying anatomical changes.

2. Cessation of distress: A natural remission is unassumable; there has been no analogy in many years.

3. Elimination of, and contraindication to, narcotics.

4. Complete disappearance of cyanosis after five years uninterrupted presence.

5. An absolute contraindication to secondary surgical procedure, with: *Corollary a*—Had the hernia with adhesions, or whatever else may have been found, been treated surgically, the result, if spasticity had been eliminated, might have been erroneously attributed to operation instead of possibly to psychic effect. It would seem more likely, *a priori,* that secondary operation might even have intensified spasticity.

Corollary b—Should, nevertheless, other indications for operation arise spasticity ought first to be therapeutically excluded.

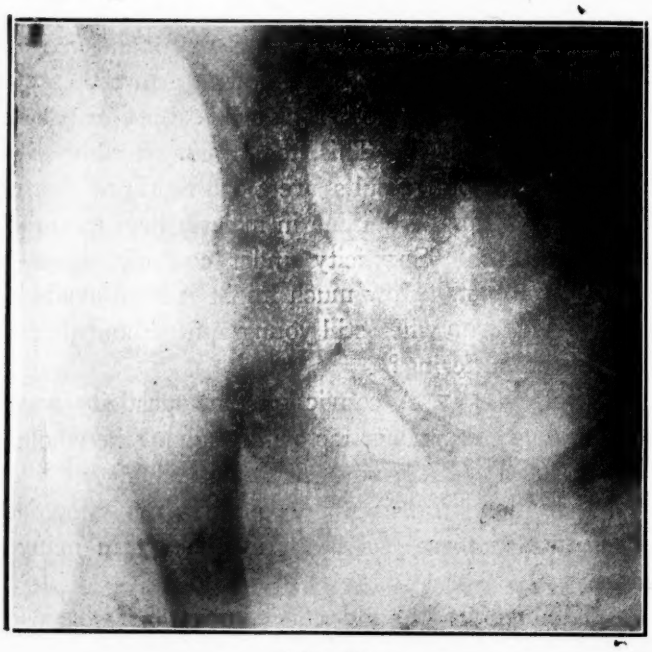
6. Disappearance of cyanosis justifiably referable

to elimination of spasticity with unknown quantity *X*, rendering the prognosis *quoad vitam* decidedly better. It is hardly assumable that so marked a predisposition will vanish any more than any other character trait. It is reasonably certain, however, that with past experience it will be controllable with equally gratifying result, thus likewise improving the prognosis *quoad valetudinem.*

IDENTIC PELVIC FRACTURES SIMULTANEOUSLY PRODUCED IN TWO INDIVIDUALS BY A COMMON ACCIDENT.

L. R. MARKLEY, M.D.,
BELLINGHAM, WASH.

On May 19, 1922, Mrs. N. and her daughter, Mrs. M., were riding in a light auto which was upset by collision with a rapidly moving, heavy car, and they were violently thrown to the pavement. They were



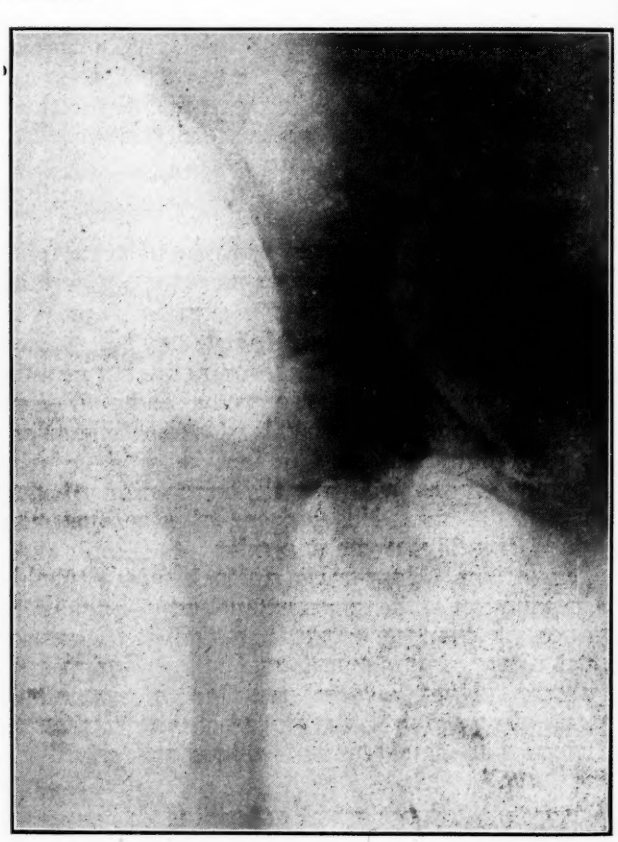
Mrs. N.

rushed to the hospital, where Dr. Ballaine graciously rendered first aid until my arrival.

In addition to their numerous small contusions and lacerations, mother and daughter sustained, as demonstrated by roentgenograms, practically identic fractures of the pelvis, viz., through the left pubis and ischium. In the daughter, Mrs. M., who also suffered a fracture of the right clavicle, and who was primigravid 6 months, there was greater displacement of the fragments and correspondingly greater separation at the symphysis pubis. She had to be catheterized for several days, which caused much pain and slight bleeding each time.

The treatment was quite simple, consisting in rest in bed, light extension of the lower extremity and swathing of the pelvis and hips in adhesive plaster. The latter was annoying to Mrs. M. because of her pregnancy, and was therefore replaced by a strong muslin binder. Both patients made a satisfactory recovery. The daughter has no limp; the mother walks with a slight limp which is growing less.

On August 20th, three months after the accident, I confined Mrs. M. She is a small woman and I anticipated that this, her first, labor would be difficult; and, indeed, a high forceps delivery was necessary on account of a narrow pelvis. At my first examination I determined that the fracture of the pelvis had united with apparently very little displacement. At this writing both infant and mother are well.



Mrs. M.

The simultaneous occurrence of the same pelvic fracture in two individuals in a common accident is, as far as I know, unique. Hence this report.

LONG BUILDING.

FRACTURE OF THE CLAVICLE

Fracture of the outer end of the clavicle may follow a fall upon the shoulder. Unless one makes a careful examination such a fracture may escape observation or be mistaken for a dislocation of the outer end of the clavicle, with which condition, indeed, it may be associated.

EMBOLISM OF THE BRACHIAL ARTERY COMPLICATING ACUTE APPENDICITIS. A CASE REPORT.*

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NEW YORK CITY.

The occurrence of plumonary embolism after appendicectomy is a well known complication. Embolism of peripheral arteries following this and other abdominal operations must be exceedingly rare for anatomical reasons. As a rule, such embolisms occur in patients with valvular disease or lesions of the aorta.

The attempts to save limbs threatened by the lodgment of emboli in the larger arteries of the extremities form a most interesting chapter of surgery. H. Sundberg, (*Hygeia*, 1920, **82**, 1-12) collected 20 cases of arteriotomy for embolus, 6 of which were completely successful. E. Key (*Acta Chirurg. Scandinav.* 1920, **52**, 507) reported 5 cases upon which he had performed six arteriotomies, with but one failure. S. Wideroe, in discussion, reported 2 cases of interest in connection with the case to be described.

One, a girl of 24, with embolism of the brachial artery at the elbow, recovered spontaneously, with no loss of tissue. The other, a woman of 54, operated upon unsuccessfully for embolism of the femoral artery, showed at autopsy a carcinoma of the stomach, and a patent foramen ovale. This was apparently a case of paradoxic embolism, the source of the embolus, however, not being stated. R. Hensel (*Deutsch. med. Wochnschr*, 1921, **47**, 625) describes a case of multiple paradoxic emboli following hysterectomy, showing at autopsy pelvic vein thrombosis and a large foramen ovale.

CASE REPORT.

J. M., chauffeur, 34 years old, was admitted to the surgical service of Dr. Beer, Mount Sinai Hospital, on February 14, 1920. Two days before admission he was seized with general abdominal pain accompanied by vomiting, fever and chills. The pain then localized to the right lower quadrant. The only facts of interest in the previous history were that he had bronchitis nine years before, influenza two weeks before and for the preceding two years he had a morning cough with production of a small amount of greenish mucus.

He was a well developed man, with flushed face, temperature 102.4°, pulse 118, apparently acutely ill. The tongue was heavily coated. There were a few crackling râles at the base of the right lung. The heart was normal. The abdomen was distended and rigid, especially on the right side. There was exquisite tenderness and rebound tenderness in the right lower quandrant. By rectum a tender mass was felt on the right side of the pelvis. The findings indicated acute appendicitis with abscess.

Because of the history of respiratory trouble I began the operation with local anesthesia, later supplemented by a light chloroform anesthesia. Through a three-inch rectus incision a large pelvic abscess was evacuated. The appendix was found adherent in the pelvis, completely gangrenous, with perforation abscess of the mesenteriolum. The appendix and most of the diseased mesenteriolum were removed in the usual fashion. A tube drain was placed in the pelvis and the wound closed in layers.

The patient progressed in the ordinary post-operative manner, until the third day, when he complained of sudden pain in the right arm and hand, increasing numbness of the fingers and inability to move them freely. The hand appeared mottled and dusky in color, felt cold, and was definitely hypalgesic. No pulse could be felt in the radial artery nor in the brachial at the elbow. A pulse could be felt, however, at junction of the lower and middle thirds of the upper arm. A diagnosis of embolism of the brachial artery was made.

Two hours later the point of pulsation had receded to the junction of the middle and upper thirds of the brachial artery and operative intervention was decided upon. Under local anesthesia Dr. Buerger exposed the brachial artery in its upper third through a four-inch incision. The surrounding nerves were separated, the vessel isolated and controlled by a traction tape. A half-inch incision was made in the vessel just above the point of closure and a thrombus was milked from below. Retrograde bleeding occurred. The vessel wound was sutured with silk, and pulsation being detected at the elbow the wound was closed without drainage. The thrombus was about 1.5 cm. in length, sterile, and showed beginning organization.

The color of the hand improved immediately, but it still felt cold. The radial pulse was not restored. The whole arm was kept warm by an electric light apparatus. Paresthesias and pain continued, requiring liberal use of narcotics. The color continued to improve, but the thumb became blue, then black and developed a beginning line of demarcation at the interphalangeal joint. The adbominal wound suppurated freely and there was some fascial necrosis.

On February 23rd, six days after the thrombectomy, a tendency to wrist-drop was noted, and the neurological examination showed definite sensory and motor changes referable to the ulnar and musculo-spiral nerves. Although the brachial wound appeared to have healed per primam, there was some deep induration requiring wet dressings.

On March 8th, a chill and rise of temperature to 105.4° occurred, but the blood culture was negative and the fever disappeared in twenty-four hours. On March 12th, a chill and temperature of 106° occurred and blood culture showed hemolytic streptococci in the flasks. On March 16th, a considerable collection of pus was evacuated from beneath the healed brachial wound. On March 18th, an abscess

*Presented before the Section of Surgery, N. Y. Academy of Medicine, November 4, 1921.

of the right thenar space was evacuated and on March 20th, the temperature had reached normal by lysis.

Because of the suppuration in hand and arm nothing was done for the neural complications except support of the wrist by a splint.

On April 7th, demarcation of the gangrene of the thumb had become well defined and the terminal phalanx was disarticulated. The head of the second phalanx was removed with rongeurs and the wound was left open. In a few days the patient was discharged for further care in the dispensary.

A month later he again came under my observation. He was suffering intensely. His nights were sleepless. The hand and forearm were atrophic, weak and rigid. The color was a dusky red, the fingers were purplish. The nails were discolored and poorly nourished. There was hyperidrosis. In the dependent position the pain and paresthesias were almost unbearable. It was found that while the musculospiral involvement had cleared up considerably there was marked impairment of the motor and sensory functions of the median and ulnar nerves.

The amputation wound was not healed completely, the stump being very tender and painful. *X*-ray examination showed two small sequestra. Wet dressings were applied and the bone fragments were extruded in the course of a month.

Treatment of the neuritis was undertaken by Dr. B. Sachs who employed daily electrical stimulation. For the vascular phenomena I ordered postural exercises, the whole arm being extended above the head for a minute, then held dependent for a minute and then in semiflexion for three minutes. This was done three times a day for twenty minutes if possible.

The result of Dr. Sachs' treatment was remarkable. Improvement began at once and in a month the fingers and wrist could be semiflexed. The patient then began to practice grasping a ball with the hand. In three months practically normal range of motion was established. At the same time atrophy of the muscles was overcome, the color and texture of the skin and nails approached normal. The vascular symptoms gradually disappeared and sedatives were no longer necessary.

On September 7th, about seven months after the vascular occlusion, I was astonished to find a very fair pulse in the radial artery, which has persisted ever since.

A month later the patient was able to resume his work as chauffeur and was entirely well.

The case presented several interesting points. The source of the embolus and its course were puzzling. With the history of cough and expectoration, bronchiectasis was suspected, but was ruled out by roentgenography and by the absence of physical signs. If the embolus came from a vein in the abdominal wall, as is the case in pulmonary embolism complicating appendicitis, we had to assume a patent foramen ovale to explain lodgment of the embolus in the brachial artery. It is conceivable that a very small bacterial embolus might have passed through the pulmonary circulation to finally lodge in a small terminal artery, and that aseptic thrombosis progressed in retrograde fashion to occlude the parent trunk. While there was no fever or chill at the time the vascular complication occurred, the subsequent development of suppuration deep in the thenar space, and the failure of the radial pulse to reappear after the thrombectomy gave some support to this theory. It seemed that the theory of paradoxic embolism was the most probable.

The marked neural involvement was explained by the suppuration which developed in the brachial wound, producing neuritis and perineuritis. Its effects were disastrous and rendered the limb useless. The remarkable result obtained by Dr. Sachs in its treatment was one of the most instructive elements in the case.

The reappearance of the radial pulse after its absence for several months requires explanation. Such a phenomenon could be due to one of two processes, either canalization of the occluded vessels, or the establishment of adequate collateral circulation by way of the superior profunda artery. The fact that pulsation can be felt in the radial artery for a distance of 6 cm. only, and that no pulsation can be detected along the course of the brachial artery below its upper third seems to indicate that collateral circulation has been the method of recovery.

103 EAST 84TH STREET.

AMPUTATION OF THE LEG.

An amputation of the leg should be based upon the following lines:

The fibula is to be removed. The scar has to be so situated as to escape pressure from the prothesis.

Avoid ligating the large vessels, which means interference with the nutrition of the flaps. Separate the tendon of the biceps muscle and other soft parts from the fibula as close to the bone as possible without injury to its periosteum and without injury to the insertion of the same tendon into the external tuberosity of the tibia.

Close the incision through the superficial fascia carefully by suture. Every part of the stump ought to be covered by the fascia.

The tibia ought to be divided at the lowest possible point but not lower than 22 cm. from the ground. A practical rule is to divide it at the middle of the leg.

The stump of the tibia should be treated according to the Hirsch-Bunge method. The scar should not pass over the end of the tibia but should be situated posteriorly and at least 3 cm. above the end of the stump.—O. BORCHGREVINK in *Annals of Surgery*.

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WALTER M. BRICKNER, B.S., M.D., F.A.C.S., *Editor*
New York City

ELMIRA, NEW YORK, NOVEMBER, 1922.

ARTERIAL DISEASE IN DIABETICS.

Although it has been demonstrated that in what is probably a large percentage of diabetics there is a fibrosis of the islands of Langerhans in the pancreas, analogous to the arterio-capillary fibrosis seen in the glomeruli in nephritis, and although well-developed arteriosclerosis is common in elderly individuals with diabetes, it has not been established—so far as we know—that there is an etiologic relationship between arterial disease and diabetes or that arterial disease is more common in diabetics than in non-diabetics.

The surgeon often sees the combination of diabetes and arterial disease, but perhaps this is because it is just this combination that underlies alarming conditions demanding his treatment. Certainly non-diabetics with well-developed arteriosclerosis very often recover promptly from wounds and injuries of the foot without developing serious infection or gangrene; and diabetics whose circulation is unimpaired will go through an infection of an extremity—satisfactorily or otherwise—without gangrene.

It is when the two conditions coexist that an infection in an extremity is very apt to cause its loss. The infection is usually in itself not virulent, but, even if the hyperglycemia is controlled, the circulation may be insufficient to combat it; the arteries may be patent enough to maintain a blood supply sufficient under ordinary conditions, but it is insufficient for the tissues when these become the seat of an infection. Whatever other, unknown, factors may be at work it seems fair to state, however crudely, that there is present this vicious circle: the infection precipitates death of tissue and the death of tissue spreads the infection. The result is usually the same whether this necrosis is in the form of a gangrene spreading from toe or heel, or of a sloughing at any part of the extremity where there is suppuration. In these cases the thin pus that can be expressed into the open wound from the tissues beyond it is characteristic of sloughing of fascia, which will not cease when exposed by free incision, rather than of frank suppuration in an abscess or an uncomplicated cellulitis, which one might hope to control by adequate drainage. It is just in these cases, especially, that the surgeon must be prepared without undue delay to sacrifice limb in order to save life. Important, too, is it to prepare the patient's family, if not at once the patient himself, for the possible necessity of this sacrifice lest when it becomes imperative too much precious time is not wasted in securing consent.

We have made some progress in the management of diabetes; still greater progress is in sight. The surgical indications have not changed, however, since we said several years ago:

"If in a diabetic, gangrene is associated with an apparently mild and very limited infection, and if the urinary and blood findings do not forbid, the surgeon is not unjustified in treating this conservatively, by free drainage and adequate absorbent dressings, *provided that the patient is under constant observation and that amputation can be performed at any time.*

"But if a single attempt at drainage does not arrest the progress of the infection, if the cellulitis extends at all, it is dangerous to delay further. Second and third incisions do no good; indeed, they seem to spread the cellulitis; and at any moment during the delay may come the dreaded explosion—acidosis and coma."

SURGICAL ASPECTS OF PAIN IN THE ARM.

Observant and experienced physicians will conclude, it seems to us, that most cases of persistent pain in the upper arm, so often treated for "rheumatism" and "neuritis," are surgical affections, at least in that they require mechanical treatment.

In the absence of arthritis or of symptoms in other parts of the body, the diagnosis of rheumatism, as an explanation of pain in the arm, is quite untenable.

Brachial neuritis is a real condition but a comparatively uncommon one. When well established, it should be marked by motor, trophic or sensory signs, as well as by nerve tenderness. In all cases it is important to determine, by careful examination, including roentgenography, whether the neuritis is not simulated or produced by some other lesion. Pain in the left arm, usually referred especially to the flexor aspects of the elbow and wrist, may be associated with an anginal condition and, as such, may be symptomatic, among other things, of tobacco poisoning.

Of the surgical conditions, aside from grosser and more evident lesions, that cause pain in the arm, we must bear in mind cervical rib (and other sources of brachial nerve pressure), fracture of the greater tuberosity of the humerus (which may occur from comparatively mild internal as well as external violence), spontaneously reduced luxation of the shoulder, subluxation of the shoulder (either of which may be produced, in some persons, by slight violence), sprain of the shoulder, periostitis of syphilitic or other origin, and neoplastic and inflammatory diseases of the bones, especially the humerus (among which chronic bone abscess, cortical or medullary, should be mentioned as an occasional cause of severe, persistent pain.) More common than any or all of these causes of pain in the arm and sometimes, but by no means always, also in the shoulder, is subdeltoid (subacromial) bursitis. It is, indeed, so often the cause of the complaint, that it should be thought of first—especially when there is, but even when there is not, more or less "stiffness" of the shoulder.

Progress in Surgery

Selections from Recent Literature

Prolapse of the Rectum in Children. EMORY G. ALEXANDER, Philadelphia. *Annals of Surgery,* October, 1922.

In 11 consecutive cases, 2 of them very severe, of prolapse of the rectum in children, Alexander secured a cure in each instance, without any ill-effects, by employing the alcohol injection method introduced at D'Espine's Clinic in Geneva and subsequently employed by Findlay of Glasgow.

The technic of D'Espine's method, as described by Findlay, is as follows: The operation is performed under general anesthesia, the patient having been prepared in the usual way by purgation or by enema for completely clearing out the bowel. The perineum is cleaned with ether and disinfected with iodine. The finger is placed in the rectum so as to gauge the position of the needle, and 1.5 c.c. of absolute alcohol is injected on each side of the rectum at about a depth of 7 cm. The needle (an ordinary exploratory needle with the syringe containing the required amount of alcohol attached) is inserted about 8 mm. (¼ inch) from the anal margin and is passed along the side of the bowel just outside of the mucous coat for about 6 to 8 cm. (2½ to 3 inches) where the alcohol is injected. The punctures are then sealed with collodion, and after applying a fairly large pad, the buttocks are strapped. The child must be kept in bed for eight to ten days and the bowels kept constipated. The patient must not be allowed to sit up to defecate; the bowel movements are passed along the side of the dressing with the child lying in bed. The dressings are renewed daily, or as often as necessary, for eight to ten days, when they usually can with safety be discarded and the child then allowed to get out of bed.

Tuberculosis in Children from the Standpoint of the Surgeon. LLOYD T. BROWN, Boston, Mass. *Boston Medical and Surgical Journal,* September 28, 1922.

Surgery in tuberculosis is and should be the exception, and it should always be made only an incident in the general and necessarily prolonged treatment.

In children operations for spinal immobilization are not advisable and without the proper postoperative care in adults they do not give the results claimed. In tuberculosis of the spine in both children and adults the ambulatory and supportive treatment has not given satisfactory results.

In children the ideal treatment is recumbency for at least two to three years, followed by carefully observed and protected weight-bearing for two years more.

In adults in selected cases the operation for spinal immobilization may be advisable if it can be followed by at least six months' recumbency and a year or more of supportive treatment.

Cholecystitis and Cholelithiasis in Children. CHARLES E. FARR, New York, N. Y. *Archives of Pediatrics,* September, 1922.

Five cases of cholecystitis are presented, all in male children, from 7 to 13 years old. One was simple, acute cholecystitis; one probably simple acute. One had calculi. One was acute suppurative; one acute suppurative with general sepsis; one probably acute suppurative with general sepsis. There was one death. All presented the usual symptoms of pain, tenderness, rigidity, vomiting, fever, leucocytosis. One had severe jaundice, two were mildly icteric. One gave a history of preceding attack with jaundice. Enteric fever may possibly have been an etiological factor in one. Staphylococcus aureus was found in the blood of two cases. Acute appendicitis was present, in mild degree, in three of the cases.

Farr concludes:

1. Cholecystitis in children is probably not very rare but is usually unrecognized.

2. So far as this small series goes male children are more often attacked than females, the reverse of adult conditions.

3. The clinical picture of cholecystitis in children closely resembles that in adults and the pathological findings are similar.

4. The preceding etiological factor, in some cases at least, is a bacteriemia.

5. Acute appendicitis is a frequent concomitant, if not an etiological factor.

Congenital Hypertrophic Pyloric Stenosis and Its Treatment by Atropine. SIDNEY V. HAAS, New York, N. Y. *The Journal of the A. M. A.,* October 14, 1922.

Pyloric stenosis is only an advanced degree of pylorospasm. It is only a single manifestation of a general hypertonic state whose etiologic factor is an overaction of the vagus portion of the autonomic nervous system. There is usually a hyperexcitability of all motor functions.

Medical treatment was formerly practiced until the success of the Rammstedt operation caused surgery to be advocated exclusively. To see and feel a pyloric tumor, with complete stenosis, and observe its histologic picture of hypertrophy of muscle fibers makes credence of any other view difficult. The problem is nevertheless a medical one, and atropin is practically a specific.

In the treatment, certain points should be observed:

(a) Errors in diet or hygiene must be corrected.

(b) In every advanced case, saline solution should be given subcutaneously at frequent intervals until enough fluid can be taken by mouth to supply body needs.

(c) Atropin, like digitalis, must be active, that is, it must be freshly prepared from the crystals. Once in solution, deterioration is rapid.

(d) In the milder cases, the drug may be given by mouth, in the bottle, or, if the patient is breast fed, in a teaspoonful of water before feeding.

(e) In the severe cases, the drug should be administered hypodermically until vomiting is controlled.

(f) The dose is variable, 1-1000 grain (or even 1-2000 grain, in rare instances) at each feeding to a maximum which either controls symptoms or produces the physiologic effect, i. e., flushing, etc. The largest dose used was 16-1000 grain at each feeding, or ⅛ grain in twenty-four hours. Beginning with 1-1000 grain, one should increase the amount at each feeding until the result is obtained, when the dose becomes **fixed.**

(g) Treatment may need to be given only a few weeks, or may be required most of the first year.

(h) There are rare cases in which much smaller doses are required to begin with.

Occasionally, constipation with severe rectal tenesmus results. The omission of a few doses of atropin relieves this.

Infants of this type are practically immune to the harmful effects of atropin.

This paper is based on an experience of more than forty cases ranging from a mild spasm to complete stenosis. One of the patients died suddenly; another discontinued treatment and was successfully operated on. The others recovered under atropin treatment, although at least 20 per cent. had been advised that operation would be required. In an illustrative case of so-called congenital pyloric stenosis with complete obstruction, the patient was cured by atropin.

Choice of Operation for Gastric Ulcer in View of the Late Results. GEORGE WOOLSEY, New York. *Annals of Surgery,* October, 1922.

There are five types of operation in this series: (1) gastroenterostomy, 19 cases; (2) excision, 8 cases; (3) mesogastric or sleeve resection, 9 cases; (4) resection by the Billroth II method, 8 cases; (5) resection by the Polya method, 13 cases. From these cases Woolsey concludes:

(1) For ulcers, three to four or more inches from the pylorus, the choice lies between excision and mesogastric resection. On account of the better results Woolsey prefers excision and gastroenterostomy, except for ulcers with hourglass contraction and large indurated ulcers, especially those on the posterior surface.

(2) For ulcers near the pylorus, or within three inches or so of it, Woolsey prefers the Polya method. It is easy, reasonably rapid and has given the best results of any method.

(3) In case the operation is done in two stages, or a gastroenterostomy has previously been done, the Billroth II method is the rational procedure, but the two-stage procedure is rarely called for in cases of ulcer.

(4) For ulcers at, or close to, the pylorus, especially such as cause a stenosis, a posterior gastroenterostomy is the simplest and safest operation, gives good results and may be the method of election for those not experienced in resection. It is quite possible for such an operation to benefit or cure ulcers remote from the pylorus.

(5) The possibility of cancerous degeneration of a gastric ulcer would in general lead to its resection or excision, but, as was long ago pointed out by Kocher and others, such degeneration is quite uncommon in cases treated by gastrojejunostomy. In view, however, of this danger, whether we class it at a high per cent. with some or a low per cent. with others, Woolsey firmly believes in the complete removal of gastric ulcers by resection or excision unless the operative risk is greatly increased on account of the general or local condition of the patient.

Late Results of Gastro-Enterostomy for Gastric and Duodenal Ulcers, Including Acute Perforated Ulcers. EUGENE H. POOL and P. A. DINEEN, New York. *Annals of Surgery,* October, 1922.

A well-placed gastroenterostomy empties the whole stomach adequately and quickly. If fluoroscopic examination shows incomplete or tardy emptying a technical fault may ordinarily be inferred. Even a well-placed stomach occasionally is associated with serious sequelae. First, there is always an appreciable risk of a gastrojejunal ulcer, variously stated as from 2 to 3 per cent. Second, symptomatic failures occasionally occur. In chronic indurated ulcers, especially those with some grade of pyloric obstruction, as represented by six-hour barium retention, symptomatic failures have not been experienced. The rare symptomatic failures apparently occur after gastroenterostomies for small non-obstructing ulcers. It is the authors' practice in all cases of suspected duodenal ulcer to determine before operation whether a six-hour barium retention is present. If such exists they feel that a gastrojejunostomy is unquestionably justifiable if an ulcer is found at operation. If no six-hour retention is noted, they endeavor to avoid a gastroenterostomy, although this is not always done, especially in large indurated ulcers. If there is uncertainty after exposure of the duodenum as to the existence of an ulcer, the lumen is opened and the mucous membrane explored. When a small non-obstructing ulcer has been demonstrated, either with or without the aid of this exploratory incision into the duodenum, an appropriate plastic operation in pylorus or duodenum, if feasible, with excision of the ulcer, is elected in preference to a gastrojejunostomy.

There were 59 cases of acute perforations. Primary gastrojejunostomy was made in only 9 of these. Thirty-seven have been followed from 6 months to 6 years; 10 had recurrences of gastric symptoms, and 7 of these required secondary gastroenterostomy. Concerning primary gastroenterostomy for perforating ulcer the authors say: "Our figures indicate that two out of three cases do well after closure alone; that one in three cases after closure of the perforation only later develop pyloric obstruction. This demands operation. But a definitely indicated late gastroenterostomy on one-third of the cases is preferable to subjecting all the cases to prophylactic gastrojejunostomies at the initial operation."

Post-operative therapy is most important, particularly diet and observation for a long period.

About the Choice between Medical and Surgical Treatment of Ulcus Ventriculi s. Duodeni. N. AAGE NIELSEN, Copenhagen. *Acta Chirurgica Scandinavia,* July 15, 1922, Vol. 15, Fasc. 1.

Concerning the development of cancer from ulcer of the stomach or duodenum, Nielsen thus concludes his study:

A review of the literature shows that it has never been possible to state the frequency of carcinoma ex ulcere; in fact, its existence has not even been demonstrated definitely.

The material studied does not indicate that simple ulcer of the stomach or duodenum has any tendency to become cancerous. It could not be proven during a period of observation of 2½—19 years that 221 patients with ulcer symptoms, which were clinically certain and several years old, had any special tendency to gastric cancer.

The disease that has formerly been considered as carcinoma ex ulcere, is a primary ulcus-simulating cancer. The symptoms appear almost always after the 30th year, and develop in the course of a relatively short time into a serious clinical "ulcer picture", on which the effect of a medical ulcer treatment is poor, or but of short duration, and have caused death in the cases examined, in the course of 1—5¼ years after the first appearance of the symptoms.

This cancer may often be clinically distinguished from ulcus simplex with so great a probability, that an operative removal of the ulcer is justified.

Cholecystenterostomy from an Experimental Standpoint. GATEWOOD, Chicago, and PETER H. POPPENS, Princeton, Ill. *Surgery, Gynecology and Obstetrics,* October, 1922.

From experiments performed upon dogs in which the gall-bladder was anastomosed to the stomach, duodenum and colon, the following conclusions are drawn:

1. The gall-bladder invariably becomes infected regardless of the viscus used for anastomosis.

2. There is little, if any, difference between the stomach and duodenum in the matter of rapidity of infection.

3. The colon is not the portion of the gastro-intestinal tract to be chosen by preference. The immediate dangers of peritonitis are much greater, and probably liver infections would occur earlier than when the upper part of the gut is used.

4. All livers become infected sooner or later if the method employed in these experiments be followed.

5. Cholecystenterostomy, from an experimental standpoint, is not an operation to be recommended for use except in well-selected cases, such as carcinoma of the pancreas where the temporary comfort of the patient is paramount, or irreparable common duct obstruction.

A Bacteriologic Study of the Fluid Contents of 100 Gall-Bladders Removed at Operation. JENNIE G. DRENNAN, Rochester, Minn. *Annals of Surgery*, October, 1922.

In a series of 100 gall-bladders removed at operation only 19% contained fluid infected with bacteria; the infecting organisms were: bacillus coli in 12% of the cases, a staphylococcus in 4%, a streptococcus in 2%, and a non-pigment-forming sarcina in 1%. The probable reason there is not a higher percentage of infected gall-bladder fluids is that the contained fluids have a concentration of bile too high, for bacteria will not grow satisfactorily if more than 70% of bile is present. In the 19% of infected gall-bladder fluids the concentration of the normal bile had been lowered by inflammatory exudates, thus permitting the growth of bacteria in the fluid contents of the gall-bladders.

Abortions and Curettements. W. G. STROBEL, Duluth, Minn. *Minnesota Medicine*, October, 1922.

Strobel thus briefly summarizes:

1. Always be sure that your patient is really a case of inevitable abortion before attempting any surgical interference.

2. Never take the patient's word that she has an incomplete abortion.

3. Never use operative measures on a septic case until the patient is four to five days fever-free.

4. Avoid curettement as much as possible; for conditions associated with pregnancy it is very seldom necessary. The number done in any hospital becomes easily an index of the ethics of the adjacent communities, not to say the medical staff.

5. Never give pituitrin or cathartics in cases of beginning peritonitis.

6. In patients with a tumor mass and history of possible pregnancy be sure to look for missed abortion.

Review of One Hundred Cases of Women with Pelvic Tuberculosis with Special Reference to the End Results of Operative Treatment. REUBEN PETERSON, Ann Arbor, Michigan. *The American Journal of Obstetrics and Gynecology*, September, 1922.

Since pelvic tuberculosis in women is usually a secondary infection it is of the first importance to find and estimate the extent of the primary focus before deciding for or against operation for the pelvic lesion.

Operation should be postponed or avoided altogether when the pulmonary tuberculous lesion is extensive.

Otherwise the percentage of primary and secondary deaths will be high, since the operative procedures may augment the pulmonary lesions, as shown in the series of 100 cases analyzed where over 50 per cent of the patients who died had demonstrable pulmonary tuberculous lesions.

The end results of the operative treatment of pelvic tuberculosis are on the whole favorable, since about 75 per cent of the patients should be alive and in good health after a considerable period of years.

Whenever the condition of the patient warrants, radical removal of the pelvic organs is indicated since more than one portion of the genital tract is usually involved in the tuberculous process and because the best end results follow such radical removal.

Unless too extensive, tuberculosis of the peritoneum will be cured if the pelvic tuberculous lesions be removed.

A Study of Adenocarcinoma of the Fundus of the Uterus. J. V. MEIGS, Boston, Mass. *The American Journal of Obstetrics and Gynecology*, September, 1922.

The uterus was enlarged in many cases but this was not a constant finding.

The average age of the patients was fifty years.

Seventy-five per cent of the patients had had children, the average number of children being three.

The average duration of symptoms was one year and eight months. Therefore if more stress were laid upon irregular bleeding there would be more successful cases.

The diagnosis of adenocarcinoma of the fundus is not easy without microscopic study.

Atresia of the cervix may easily be confused with adneocarcinoma of the fundus.

There are 62.5 per cent of authors' cases without recurrence to date, five years or more after operation.

There were 14 cases from 1903-1913, the first ten years, and 30 from 1914-1921, the last eight years, which is an increase of 2 cases a year.

Adenocarcinoma of the fundus is not a common tumor in hospital practice, there being but 44 cases out of 9,566 operated upon since 1903, but in private practice it is undoubtedly much more common, being more frequent than carcinoma of the cervix.

Complete hysterectomy (not Wertheim's method) assures most success.

Operation rather than radium is the method of choice.

Five patients out of 44 had metastatic growths in the adnexa. Therefore bilateral salpingo-oöphorectomy should always be performed along with the removal of the uterus.

The differential diagnosis microscopically from gland hypertrophy is sometimes difficult.

The Treatment of Cancer of the Breast. FREDERICK H. KUEGLE, Sioux City, Iowa. *Minnesota Medicine*, October, 1922.

In broad terms, at least one-fourth of the cases coming for medical advice are inoperable. Even with the best of surgery, the ultimate history of breast malignancies is anything but encouraging from the standpoint of a permanent cure. Even in the best of hands 52.55 per cent of operated cases recurred within a period of four years.

When one considers that recurrent cases are seldom, if ever, amenable to further surgical interference, since statistics favor the conclusion that operation on the whole shortens life in recurrent cases, and when one recalls that at least one-fourth of all cancers of the breast are inoperable when they are brought to the physician's attention, the limitations of surgery can be appreciated.

At the Massachusetts General Hospital, Greenough reports that of 236 cases with papable axillary nodes only 12 per cent were cured by operation, while of 275 similar cases Finsterer reports only 4.3 per cent as cured. Ewing is of the opinion that the last figure represents the average success obtained by surgical treatment, which means that, when a woman presents an established mammary cancer with axillary nodes palpably affected and firmly fixed, she has about one chance in 25 of being cured by operation.

It is this type of case in which preoperative *x*-ray treatment is indicated. If an intensive *x*-ray irradiation in massive dosage is administered in accordance with the technic now employed, the following results are to be expected: there will be a marked recession in the glandular enlargement; the cancer cells if not killed become encapsulated and their malignancy reduced; many of the smaller lymphatic channels will be obliterated and the tendency to rapid metastasis is thereby greatly inhibited. If a period of 3 to 4 weeks is allowed to elapse between the time of irradiation and operation to permit a maximum amount of peri-lymphatic fibrosis to form, then operation can be made with a minimum risk.

Boggs advocates that the operation be limited to the removal of the primary tumor and believes that the axilla should not be disturbed on account of its richness in lymph channels, which, when opened, increase the danger of a rapid extension of the disease. He thinks that with the primary tumor excised, the lymphatic involvement can best be controlled by radio-therapy, and that much better results will follow than if the axillary metastatic mass is removed surgically. It is the author's conviction that this form of therapy will improve cancer statistics if the *x*-ray irradiations are administered in lethal dosage.

He believes every case of operated breast tumor in which the diagnosis of cancer is confirmed by the microscopist should receive post-operative *x*-ray treatment. If this therapy is given intelligently by a trained radio-therapeutist, certain definite results can be achieved. Any deep-seated cancer cells which have escaped removal with the scalpel can be killed outright or at least so modified in their life cycle as to cause their becoming encysted. The scar, which

is frequently extensive and exceedingly painful on account of tissue retraction and which is often decidedly keloid in character, is rendered soft and pliable and entirely painless.

Horseshoe Kidney. EDWARD S. JUDD, WILLIAM F. BRAASCH, and ALBERT J. SCHOLL, JR., Rochester, Minn. *Journal of the A. M. A.*, October 7, 1922.

Sixteen cases of horseshoe kidney seen at the Mayo Clinic, which required operation, are analyzed. In seven there was hydronephrosis; in six of these the diseased segment was removed, and in the seventh the isthmus was divided and the diseased kidney rotated in order to permit the ureter to lie in the normal position. One patient died; the others recovered rapidly from the operation. Four are now perfectly well; one, eight years; one, four years; and two, one year, after operation. Two years after operation, one patient was able to work for a living, although she still felt weak. The formation of stone is common. Eight patients of the series were operated on for renal calculi; most were removed through a lumbar incision. There were no deaths. Three patients are perfectly well; one, five years, and two, two years after operation. Two patients are in excellent health, but still have occasional dull pain in the lumbar region; one, four years, and one, one year after operation. One patient was well four months after operation, but the urine still contained pus. One patient, seven months after operation, had not had a recurrence of renal colic, but dysuria and frequency continued. In one case, heminephrectomy for tuberculosis was followed by a good result. In spite of technical and clinical complications, the results of the operation on fused kidneys have been just as good as similar operations on normally developed kidneys.

Bone Atrophy. BARNEY BROOKS, St. Louis, Mo. *Southern Medical Journal*, October, 1922.

For this study material was obtained from patients suffering from poliomyelitis, traumatic nerve injuries, tuberculosis of bone, fracture, acute pyogenic osteomyelitis, deformities, and other conditions in which one extremity had not been used; also the bones of animals in which function of one extremity had been impaired by nerve section, joint injury or simple fixation by a plaster cast. The bones of the non-used extremity were compared with the bones of the used extremity. The bones were studied in gross, by *x*-ray, microscopically, chemically, and physically. In all instances the changes were the same regardless of the cause of the non-use, thus showing that there is no necessity for assuming that any factor other than lack of function was responsible.

Bone changes make their appearance in a very few days after the cessation of function of the extremity. In the experimental animal well marked changes are found after ten days of non-use. The changes progress rapidly and are very marked in ten to twelve weeks. Apparently a maximum is reached in six to twelve months beyond which there is very little change.

In the adult, non-use causes the bones to become lighter and more fragile. The length of the bone is unchanged. The diameter is only slightly decreased. The diameter of the medullary canal is markedly increased. This makes the cortex of the shaft much thinner. The trabeculae of the cancellous bone of the epiphyses become much thinner and in many areas disappear completely.

After long periods of non-use the compact bone of the shaft becomes cancellous. There is a loss of mineral constituent and an increase in the proportions of organic material. The strength of the whole bone is much decreased.

Lack of function affects the size, shape, weight, *x*-ray appearance and strength of bones by a change in the amount of the matrix present and the characteristics of bone tissue are not changed. The change is quantitative and not qualitative.

If the onset of the cessation of function is during the growing period the process of non-use bone atrophy is associated with the process of bone growth which is inhibited by lack of function, and the end-result is entirely different from that following lack of function beginning after growth has been established. The end-result of constant lack of function during the growing period on a bone of an extremity is to produce a bone which is relatively shorter and smaller.

Regeneration is a property of the bone cells and not of the bone matrix. From a clinical study of the repair process in atrophied bones and the study of animals in which transplants of atrophied bone have been compared with transplants of non-atrophied bone, it was not possible to detect any difference in the regeneration power of these two types of bone transplants. When it is considered how frequently one sees in the literature the statement that function is essential to the success of a bone transplant this seems like rank heresy.

Bone atrophy is a condition from which recovery is very slow, if indeed it is ever complete. Therefore, it is very important that it should be prevented. The only way it can be prevented is by the preservation through the period of treatment of a disease of as much functional use as is consistent with the proper healing of the disease.

Autogenous Versus Heterogenous Bone Pegs. GEORGE DE TARNOWSKY, Chicago, Ill. *Surgery, Gynecology and Obstetrics*, September, 1922.

The clinical behavior of a beef-bone graft depends entirely on the relative activities of the osteoblasts and osteoclasts:

1. With proliferation of new cells from the living proximal and distal ends of the fractured bone keeping pace with absorption of dead cells from the graft, complete disappearance of the latter coincides with complete union of the fracture or filling in of the defect.

2. With hyperactive new cell formation and sluggish absorption, the graft constitutes a sequestrum which either eburnates and remains in a state of quiescence or acts as an irritant foreign body with sinus formation and periodic extrusion of dead bone spicules.

3. With hyperactive bone absorption and sluggish new-bone formation the graft disappears by combined extrusion and absorption before union or filling in of the defect has taken place.

The factors which enable us to attain the ideal, i.e., an even balance of absorption and proliferation are: first, the thorough trimming off of dead bone proximally and distally with curette and chisel; second, firm approximation of the bone graft to living bone: and, third, absolute asepsis.

The term infection, as applied to bone surgery, is too loosely used. In many cases of so-called septic results we are merely dealing with rapid necrosis of the graft without infection—using the latter term in its proper sense. In other words, subacute osteomyelitis, with no anti-body reaction on the part of the individual should not be classed as an infection but as ordinary tissue necrosis.

Not only ivory inlays, screws and nails are well tolerated and slowly absorbed, but the beef-bone peg or inlay is equally non-irritant in most cases. Tarnowsky's deductions are based on results obtained in 17 cases of beef-bone pegging and the use of ivory screws or nails in about 50 cases. Intramedullary pegs were used in all cases, the prime object being to evolve a simple technic which might be available to the average surgeon in the average hospital. Any of the long bones of a steer will answer the purpose. The bone is denuded of its periosteum, cut to the proper size and boiled 2 consecutive days for 2 hours. The pegs are then kept in a sterile container and the peg needed for a given operation is resterilized with the instruments. It is of prime importance to fit the peg to the medullary canal and not to drill or gouge the canal in order that the peg may fit into it; under no circumstances should bone marrow be curetted away as it is the chief blood supply of living bone. The graft must be in perfect contact with healthy vascular bone above and below, it must be of sufficient length to reach well into living bone and it must be immobilized in this position. Occasionally, ivory or bone screws may have to be applied in order to insure against slipping of the peg. The introduction of the peg, after angulation of the seat of fracture after the technique of Lane, does not present any difficulties. In order to divide the peg evenly between the proximal and distal fragments, ¾ of it may be introduced into the medullary cavity of one fragment and then, after alignment of the bone and introduction of the peg into the other fragment, one of two methods may be used to obtain the proper division of the graft and thus prevent the possi-

bility of angulation. If a gap exists between the fragments, the peg is pushed up or down the required distance by means of a mallet and chisel; if no gap is present, an oblique hole is drilled over the long end of the peg into the medullary canal and the detached drill is used to punch the peg into place. Prior to alignment of the fragments, both ends must be thoroughly freshened with the bone curette or chisel, and after immobilization of the peg the soft tissues must be closely coapted over the repaired bone to insure its close contact with free blood before closure of the skin.

Cancer of the Larynx Treated by Radium. DOUGLAS QUICK and F. M. JOHNSON, New York. *New York State Journal of Medicine*, October, 1922.

The authors conclude:

1. While radium offers a hope to a larger number of cancers of the larynx than the older methods, its use must be considered, to a certain extent, experimental as yet.

2. Before treatment of a laryngeal neoplasm is undertaken proper classification, based on what can be reasonably hoped for, should be made and the method and intensity of treatment governed accordingly.

3. While treatment of primary operable intrinsic cancer of the larynx is permissible, the evidence to date does not warrant advocating it as the agent of choice.

4. It is suggested that the pre-operative use of radium in operable cases would add materially to the end result.

5. Surgical exposure may frequently be used to advantage in radium localization.

6. The radical use of intensive radiation is permissible in cases offering a reasonable hope for complete recovery.

7. The conservative use of radiation in inoperable cases offers palliative relief in a large percentage.

8. Radium should be withheld in the very advanced cases

Blood Transfusion in Cholemia. GUSTAF PALLIN, Alingsas. *Acta Chirurgica Scandinavica*, September 18, 1922.

This article is a plea for the employment of blood transfusion in the prevention and treatment of hemorrhage in operative cases associated with cholemia.

Experimental Results of Cable Grafts and Tubes of Fascia Lata in the Repair of Peripheral Nerve Defects. WILLIAM O. OTT, Rochester, Minn. *Minnesota Medicine*, October, 1922.

Experimentally, autogenous cable grafts over a gap of 4 cm. result in satisfactory return of function; they require somewhat longer time than end-to-end sutures, and the return of function is not so complete.

Tubes of autogenous fascia lata used to bridge gaps of 4 cm. result in delayed and incomplete return of function, if any at all. In most cases no return of function results.

Regeneration takes place through the fascial tubes. At first the nerve elements are abundant, but later they are largely replaced by fibrous tissue.

Book Reviews

Treatment of Injuries of the Peripheral Spinal Nerves. By SIR HAROLD J. STILES, K.B.E., F.R.C.S. (Edin.), Regius Professor of Clinical Surgery, University of Edinburgh; Formerly Assistant Inspector of Military Orthopedics and Chief Surgeon to the Orthopedic Department of the Edinburgh War Hospital, Bangour; and M. F. FORRESTER-BROWN, M.S., M.D., (London), Formerly Surgeon, Edinburgh War Hospital. Octavo; 180 pages; 58 illustrations. London: HENRY FROWDE and HODDER & STOUGHTON, 1922.

This is a concise but satisfying exposition of the management of nerve injuries from the standpoint of operative treatment. Based upon a very large experience in the war, it is intended to reduce this to text-book presentation for the benefit of surgeons less familiar with the work. There is a brief section on diagnosis in general, but symptomatology is not considered except schematically. The work is thus essentially limited to a discussion of surgical therapy.

Part I deals with general considerations: anatomy, diagnosis, types of lesion, indications for operation, choice of operation (operative methods in general), prognosis, order of recovery and after-treatment. It is interesting to note that in two cases Tinel's sign was absent even when regeneration was almost complete.

Part II describes operative methods in detail as applied to (war) injuries of various nerves and at various levels in the extremities. Methods of approach and surgical anatomy are well described and clearly illustrated by drawings in color. Procedures to be employed when end-to-end suture is impossible are considered in four pages. Nerve-grafting was performed but six times at the Edinburgh War Hospital. Two nerve flap operations were done—with poor results; the authors find objection to this operation on grounds largely mechanical, rather than wholly physiological! In the treatment of causalgia they believe that alcohol injections are more transitory in effect and more apt to damage a nerve than resection and suture.

Part III is devoted to tendon transplantations. There is described therein an ingenious operation devised by Stiles of transplanting slips from the sublimis tendon in the finger, into the extensor, to compensate for paralysis of the lumbricales.

Surgical and Mechanical Treatment of Peripheral Nerves. By BYRON STOOKEY, A.M., M.D., Associate in Neurology, Columbia University; Assistant Surgeon, New York Neurological Institute; Assistant Professor of Neurosurgery, New York Post-Graduate Medical School and Hospital. With a Chapter on *Nerve Degeneration and Regeneration* by G. CARL HUBER, M.D., Professor of Anatomy and Director of Anatomical Laboratories, University of Michigan. Royal octavo; 575 pages; 217 illustrations and 20 charts. Philadelphia and London: W. B. SAUNDERS COMPANY, 1922.

In this attractive volume Stookey has given to the profession an admirable treatise. Of the various monographs on the surgical treatment of nerve injuries that have come to our attention during and especially since the war, this is quite the most comprehensive and complete. It is a very thorough presentation of the subject, soundly based upon embryologic, anatomic and physiologic considerations, the processes of nerve degeneration and regeneration (on which subject there is an excellent chapter by Professor Huber), experimental studies, a large personal experience, and a digest of the world's literature.

Unlike the recent work by Stiles and Forrester-Brown, this one is not limited to the treatment of war injuries of peripheral nerves, but describes also the surgery of paralysis of the facial, recurrent laryngeal and spinal accessory nerves, obstetrical brachial plexus palsies, plexus irritations by cervical rib, lateral process and thoracic rib pressure, nerve tumors and amputation neuroma.

We shall not attempt an analysis nor a complete description of the contents of this well-conceived and well-balanced work. Its character we have sufficiently indicated in general terms. The symptomatology of various nerve lesions is not discussed; these have been sufficiently established in the classic publications of Athanassio-Bénisty and of Tinel which leave little for others to add. In the chapter on indications for operation, however, there is a consideration of methods of examination. Herein Stookey says "The terms epicritic and protopathic should be discarded and in their place each form of sensation should be specifically designated, using the terms of the stimulus employed—as pin prick area, cotton wool area, etc." In the same chapter he says "it has been shown that Tinel's sign may be present when there is practically no anatomical continuity, or only a few stray neuraxes within the distal segment". Following the introductory and very important chapters on the anatomy (and embryology) of the spinal nerve and on nerve degeneration and regeneration, Stookey considers in great detail the various surgical methods of nerve repair, including criticism of grafting and transplantation methods, tubulization, etc., as well as a description of the meticulous technics of neurorrhaphy, neurolysis, cable-graft implantation, nerve crossing. He places among methods to be con-

demned, the nerve flap operation, suture à distance, and lateral implantation; and bases his objection on sound physiologic and histologic considerations no less than on reports of results. There is an interesting chapter on direct nerve implantation into paralyzed muscle and direct nerve-muscle flap implantation, both of them (especially the latter) procedures that require further experimental observation. A separate chapter on mechanical treatment emphasizes the importance of this adjuvant to surgery, pre- and post-operatively. Injuries to individual nerves and to nerve plexuses are considered in the subsequent chapters. In a chapter on causalgia, the importance of nerve-freeing, where indicated, is emphasized; Sicard, and Pitres and Marchand, are quoted as showing that alcohol injections have been used with complete success, and without affecting motor fibers; and the doubtful value of Lériche's perivascular sympathectomy is suggested in a discussion of the anatomical considerations. References to other authors are very numerous throughout the book, and to each chapter is appended a list of the references therein.

The surgeon who equips himself with the works of Mme Athanassio-Bénisty and of Tinel (of which there are English translations) and this excellent and attractive monograph of Stookey has a library on the symptomatology, diagnosis and treatment of nerve injuries to which nothing has to be added. In scientific basis, thoroughness of discussion and literary completeness, Stookey's is a treatise of which American medicine has a right to be proud.

Radium Therapy. By FRANK EDWARD SIMPSON, A.B., M.D., Professor of Dermatology, Chicago Policlinic; Adjunct Clinical Professor of Dermatology, Northwestern University Medical School; Attending Dermatologist, Mercy Hospital, Alexian Brothers Hospital, Henrotin Hospital, etc.; Former President, American Radium Society; Director of the Frank Edward Simpson Radium Institute. Large Octavo; 391 pages; 166 original engravings. St. Louis: C. V. MOSBY COMPANY, 1922.

It would be but trite, indeed, to say that this work is "timely". Certainly we need now such a book, setting forth as it does, in a manner "comprehensive" rather than exhaustive, the known facts of the physics and biologic effects of radium, the modes of applying it, the conditions in which it may be expected to afford relief, the indications for and limitations of radiotherapy. How well this field is covered may be gathered from a list of the chapter titles: The Radioactive Substances, Radium-Origin and Chemical Nature, Radium Emanation and Radioactive Deposit, Technic of Preparing and Measuring Radium Emanation, Radiations from Radium and its Decay Products, Absorption and Filtration of Rays, Physical and Chemical Effects, Biological Effects, Radium Reaction, Therapeutic Apparatus, Dosage, Technic, Radium in General Surgery, in Gynecology, in Dermatology, in Ophthalmology and in Oto-Rhino-Laryngology, in Diseases of the Ductless Glands, in Internal Medicine, Professional Injuries by Radium, Bibliography.

The description of such details as the physics of radioactive substances, screening and dosage, is clear and these data are made as readily comprehensible as one might expect of such exact and technical details.

The book is written in a scientific spirit and nowhere displays undue enthusiasm or lack of critique. References in the text to other authors are very numerous, and the final chapter is devoted to an exhaustive bibliography; it consists of about 60 pages of titles in small type and appears to be as complete as effort could make it. The work is rich in excellent illustrations, and is attractive also in typography and choice of paper.

The Thyroid Gland. Clinics of GEORGE W. CRILE, M.D., and Associates. Edited by AMY F. ROWLAND. Octavo; 228 pages; 106 illustrations. Philadelphia and London: W. B. SAUNDERS COMPANY, 1922.

This collection of studies from Lakeside Hospital contains contributions from the entire staff. Everyone from director to nurses has something to say. The operative details are described with consummate art and meticulous detail. Unfortunately Crile's brilliant attainments in the operating room are not a measure of his achievements as a clinician. Fancy has full rein in the papers on Thyroid Function and the Physical Interpretation of the Rôle of the Adrenals in Exophthalmic Goiter. The indication set for operative treatment, hyperthroidism, is one which can be ill-supported by most physicians. The recent studies of New York investigators, Kessel, Lieb and Hyman, make the determination of what constitutes hyperthroidism more and more nebulous. The weakness of this criterion and the additional fact that prolonged rest is associated with surgical maneuver raises an uneasy suspicion that the brilliant statistics might not have been obtained had a more searching scrutiny of operation necessity been exercised. The collection of essays merits the study of those interested in thyroid therapy and operations, even though they differ with the viewpoint of the chief contributor.

Clinical and Operative Gynecology. By J. M. MUNRO KERR, Professor of Obstetrics and Gynecology, Glasgow University (Muirhead Chair); Gynecological Surgeon, Royal Infirmary, Glasgow; Honorary Fellow American Gynecological Society, etc. Large octavo; 832 pages; illustrated. London: *Oxford Medical Publications*: HENRY FROWDE and HODDER & STOUGHTON, 1922.

This work was written by a man of large clinical and teaching experience, who has produced valuable books. That he has failed in the present volume seems ascribable to the form which he has selected and to the method of presentation. The pioneers, such as Sims, Emmet, Spencer, Wells and Tait, described their personal experience convincingly and in such a fashion as to be instructive even today, but then gynecology was still a young, simple and uncomplicated specialty. Today women's diseases, as Kerr recognizes by having the chapters on nervous diseases, origin of the reproductive organs and venereal diseases written by other authorities, are intimately associated with other branches of medicine. The personal method of presentation, therefore, is much more difficult to carry out, and judging by the volume under discussion has failed in this instance.

The book makes the impression of desultoriness, of lack of definiteness, of having been put together at odd moments. The references are not only scant in number, but, with the exception of a few, are strictly limited to British sources, and almost all refer to articles written before 1917. There is no excuse in presenting a table of the age incidence of carcinoma of the uterus (p. 364) for giving percentages and not stating the number of patients upon whom the statistics are based; were there 20 or 2,000?

Kerr's book, however, also has excellent points. The concise, almost diagrammatic method of presentation employed in the section dealing with operative gynecology is admirable and deserves to be imitated by others. The line drawings are excellent, the twelve colored plates superb.

The Treatment of Fractures: With Notes Upon a Few Common Dislocations. By CHARLES LOCKE SCUDDER, M.D., Conculting Surgeon to the Massachusetts General Hospital; Fellow, American Surgical Association; Member of the American Society of Clinical Surgery. *Ninth Edition.* Large Octavo; 749 pages; 1252 illustrations. Philadelphia and London: W. B. SAUNDERS COMPANY, 1922.

The eighth edition of "Scudder" appeared in 1915, early in a war that has effected a revolution in the treatment not merely of compounded and infected but also of simple fractures. The surgery of the war revived and elaborated suspension and traction methods and established them as standard today in the management of fractures of the extremities. The surgeon who is not now familiar with the technics of the various modes of, and apparatus for, applying traction and suspension, and with the details concerned in the preservation of joint function, is not adequately prepared to undertake the treatment of, especially, fractures of the humerus, femur and tibia.

All this new matter Scudder has introduced in the revision of his book, comprehensively and with interesting critique and, too, without undue enlargement of the book.

Pictorially and textually Scudder's Fractures has always seemed to us a wholly satisfactory and certainly an attrac-

tive, practical text-book and guide. In this up-to-date revision it will continue to hold its place.

Physical Diagnosis. By W. D. ROSE, M.D., Lecturer on Physical Diagnosis and Associate Professor of Medicine in the University of Arkansas; Visiting Physician, City Hospital, Baptist Hospital and St. Vincent's Infirmary, Little Rock, Arkansas. *Third Edition.* Octavo; 755 pages; 319 illustrations. St. Louis: C. V. MOSBY COMPANY, 1922.

In this edition, section 4, dealing with the physical examination of the circulatory organs has been entirely rewritten and much new matter has been incorporated. Included in this section is a new chapter on electrocardiography by Drew Luten of St. Louis. Although the work describes the physical examination of the abdomen (part 2), the head, neck and extremities (part 3) and the nervous system (part 4), it is chiefly occupied with the examination of the chest. In this field, especially, it is a very good exposition of physical signs and methods of diagnosis. There is, thus, a section of 150 pages devoted to a description of the examination of the chest wall and the lungs, by inspection, palpation, percussion and auscultation; and this is followed by a section of nearly 100 pages dealing with the diseases of the lungs and pleura, seriatim, from the standpoint of their physical signs.

Curiously enough there is introduced in the section on physical examination of the respiratory organs a chapter, by Dudley E. Mackey, New York, on radiographic diagnosis of various parts of the body! Since it occupies but 25 pages, chiefly taken up with illustrations, it is not very serviceable. It seems to us illogical to consider radiography in a work on physical diagnosis that does not also consider bronchoscopy, cystoscopy, ophthalmoscopy, etc., and is silent concerning palpatory diagnosis by vagina and by rectum!

The Diseases of Children, Medical and Surgical. By the late HENRY ASHBY, M.D. (Lond.), F.R.C.P. and the late G. A. WRIGHT, B.A., M.D. (Oxon.), F.R.C.S. *Sixth Edition* by HUGH T. ASHBY, B.A., M.D. (Camb.), M.R.C.P. (Lond.), Honorary Physician to the Manchester Children's Hospital; Visiting Physician for Children to the Manchester Board of Guardians; Physician to the Salford Royal Hospital; and CHARLES ROBERTS, M.B., B.S., (Lond.), F.R.C.S., Consulting Honorary Surgeon to the Manchester Children's Hospital; Honorary Surgeon to the Manchester Royal Infirmary. Octavo; 769 pages; illustrated. London: HENRY FROWDE and HODDER & STOUGHTON, 1922.

Ashby and Wright's Diseases of Children became familiar to the English-reading profession many years ago and was highly regarded as a text-book based upon very large personal experiences. It was unique in that it was surgical as well as medical, having been jointly written by an internist and a surgeon working together in the same Manchester hospitals. The last edition by the original authors appeared in 1905.

In this revival and revision the book has maintained its character, for its authorship is again jointly that of pediatrician and surgeon, associated on the same hospital staff in Manchester. The work has, of course, been largely rewritten. It is, as before, essentially representative of the authors' experience. A great deal of new matter—the pediatric development of the last 17 years—has been introduced and to keep the work from becoming too bulky the authors deemed it wise to omit not only many of the case reports but also most of the references. The latter omission seems to us unfortunate. We think that even the student would want to know, for example, that amaurotic family idiocy was first described by Sachs.

A Practical Medical Dictionary. By THOMAS LATHROP STEDMAN, A.M., M.D., Editor of the "Twentieth Century Practice of Medicine" and of the "Reference Handbook of the Medical Sciences", recently Editor of *Medical Record. Seventh Edition.* Large Octavo; 1144 pages; illustrated. New York: WILLIAM WOOD AND COMPANY, 1922.

Medical nomenclature grows with the developments in medical science and our dictionaries need to be revised at short intervals. With this, the seventh, edition of Stedman's popular medical dictionary, it enters its second decade. The author tells us that between 400 and 500 new terms have been added, but the size of the work has not been materially affected for some obsolete terms have been dropped and some definitions shortened. In addition to medical words the dictionary includes veterinary, chemical, botanical, electrical, life insurance and other special terms, anatomical tables, American and British pharmaceutical preparations, lists of synonyms, information concerning the baths of America and Europe, and much other information.

Physiology and Biochemistry in Modern Medicine. By J. J. R. MACLEOD, M.B., Professor of Physiology in the University of Toronto, Canada. Assisted by ROY G. PEARCE, A. C. REDFIELD and N. B. TAYLOR and by others. *Fourth edition.* Royal octavo; 992 pages; 243 illustrations including 9 plates in colors. St. Louis: AND COMPANY, 1922.

The third edition of MacLeod's treatise represented an extensive revision and appeared but two years ago. No voluminous changes were required, therefore, in bringing the work up to date for this, fourth, edition; and these were made without changing the paging. Nevertheless each chapter was revised to include new matter, e.g., the recent work on capillary circulation, intracardiac pressure, pancreatic diabetes, etc. Rewritten are the chapters on the output of the heart, alterations in the acid base equilibrium of the blood, the normal electrocardiogram, and the movements and emptying of the stomach.

The recent development, in MacLeod's laboratory, of a pancreatic extract that will prevent diabetes in pancreasectomized animals, and appears to control diabetes in humans, adds interest to this scholarly treatise.

The Surgical Treatment of Non-Malignant Affections of the Stomach. By CHARLES GREENE CUMSTON, M.D., and GEORGES PATRY, M.D., Lecturers at the University of Geneva and Members of the Surgical Society of Switzerland. With an Introduction by SIR BERKELEY G. A. MOYNIHAN, K.C.M.G., C.B., M.S., Professor of Clinical Surgery, University of Leeds. Octavo; 349 pages. Philadelphia: J. B. LIPPINCOTT COMPANY. London: WILLIAM HEINEMANN LTD., 1922.

The book consists of two parts: one, devoted to the various forms of stomach operations; and the other, to a consideration of the pathological and clinical aspects of ulcer. It is essentially of an historical, or biographical nature and for that reason has a certain value for those of us, who, being busy with the daily routine of practice and research are likely to be unacquainted with the steps by which surgery and medicine have made advances. The authors have treated their subject well from this standpoint and the matter makes interesting reading. One might perhaps disagree with several of the viewpoints taken by the authors in regard to gastroenterostomy but all of these are still unsettled matters and subject to discussion.

Le Problème Du Cancer. Par WILLIAM SEAMAN BAINBRIDGE, A.M., ScD., C.M., LL.D., Professeur de chirurgie a la New York Polyclinic Medical School and Hospital; Chirurgien et secretaire des recherches au New York Skin and Cancer Hospital; Chirurgien consultant Manhattan Hospital, Ward's Island; President honoraire du Congrès International d'Heidelberg, 1906, pour l'etude des tumers et du cancer; Medical Inspector, Commander U. S. Navy, Reserve Force; Delegué officiel des Etats-Unis au Congrès de medecine et de pharmacie militaires, tenu a Bruxelles, en 1921; Membre correspondant etranger de l'Academie Royale de Medecine de Belgique; Officier de la Legion d'Honneur. Traduit De L'Anglais Par le DR. HERTOGHE, D'Anvers, Membre titulaire de l'Academie Royale de Medecine de Belgique. d'apres la première édition de la Macmillian Company de New York. Revue et mise a jour par l'auteur. Octavo; 484 pages; illustreé. Louvain: LIBRAIRIE UNIVERSITAIRE, 1922.

This French translation of Bainbridge's "The Cancer Problem", revised by him, is, we are told in the publisher's notice, the first work to appear from the reconstructed press of the University of Louvain since its destruction by the Germans in 1914.